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FEBRUARY 15, 1940



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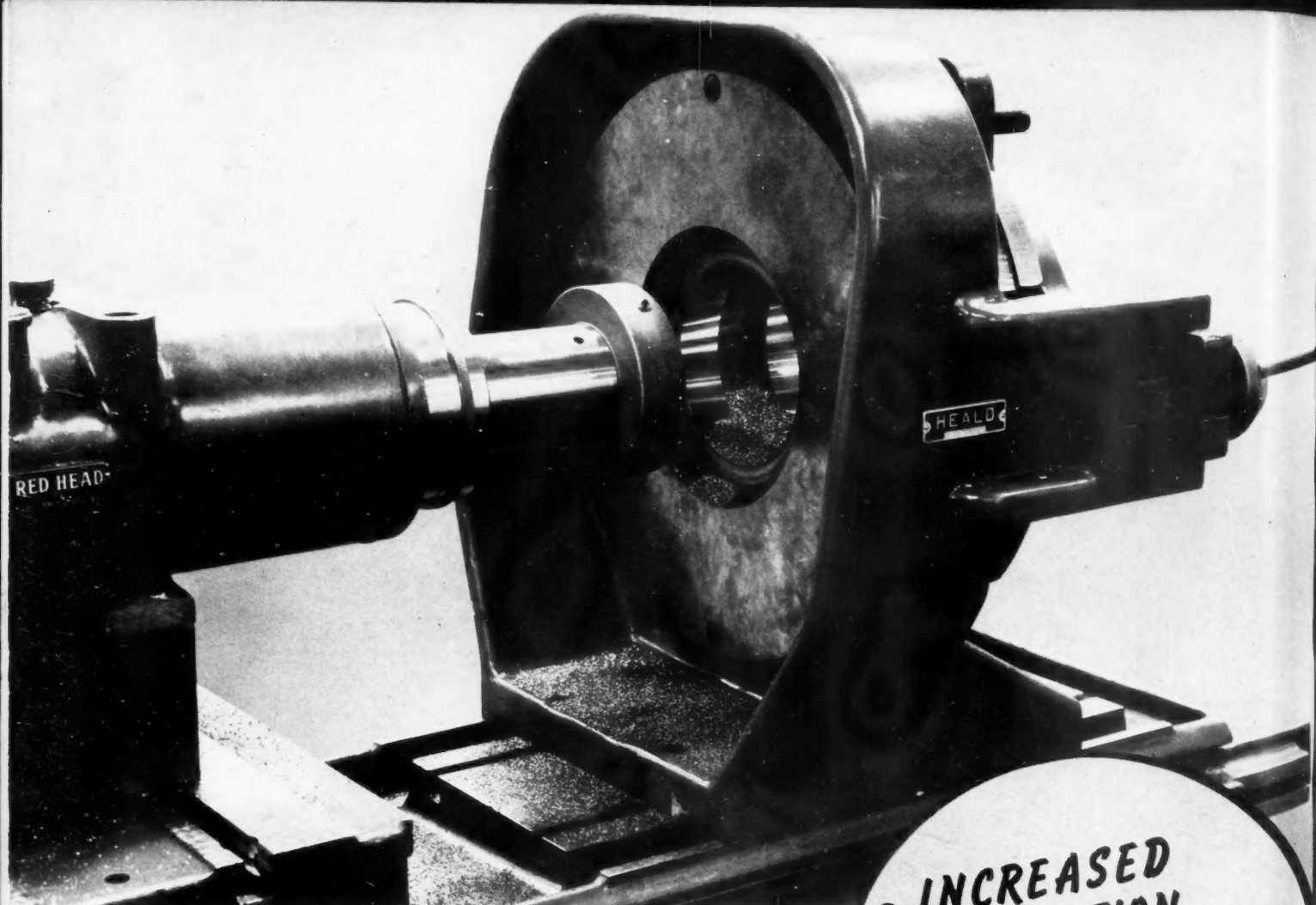
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AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 82

Number 4

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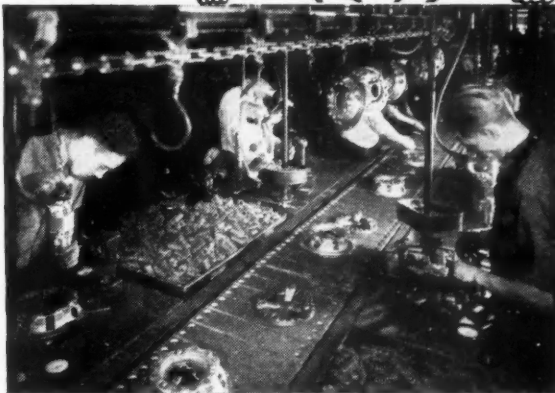
Automotive Industries

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February 15, 1940



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IN THIS ISSUE . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.
Volume 82 Feb. 15, 1940 Number 4

THE EARLY experimenters with steam-propelled vehicles (circa 1825) ran them on the highways, as well as on crude rails. It's possible that if the highways of the period had been better, there would never have been the intense rail development the nineteenth century saw.

Early visions of powered vehicles which would operate on roads or rails have never died. In a period of declining rail revenues, and the necessity—for the sake of the national welfare—of reaching some coordinated plan for the successful combining of the highway and railroad facilities of the nation, these visions assume new significance.

A. F. Hickman, who has been associated with the Truck Equipment Co. in the development of his gravity springs and other inventions, has turned his considered attention to the problem of road-rail vehicles in a meaty, illustrated brochure which he calls "Transportation of Tomorrow."

Mr. Hickman is convinced that: "The maximum economies and safety available through transportation will never be obtained until the highway and railroad freight vehicles are made to interchangeably operate on highways and railroads."

It would be presumptuous to criticize Mr. Hickman's feeling about this without having given the problem a few of the years of creative thinking he has devoted to it. The chief purpose of these paragraphs is to suggest that you get a copy of his brochure if the problem interests you from any point of view.

We have just received a bulletin discussing industrial photographs—how to take them so as to produce good-looking illustrations that really tell the story. This guide is the result of a study made by the Mason-Dixon Industrial Advertisers, a chapter of the National Industrial Advertisers Association. Considering the hundreds of photographs we use in our own publication, the thousands of pictures taken by the publicity departments of the industry, in our own selfish interest we commend a reading of this brief and instructive bulletin. Copies may be obtained from N.I.A.A. headquarters, 100 E. Ohio Street, Chicago, Ill.

Automotive Industries

GENERAL

Do We Need the Wagner Act? Let's Find Out 137

The pros and cons of this piece of legislation have brought out a great deal of discussion since its passage. It has wrought many changes in the employe-employer relationship. Here is a discussion of the subject by Julian Chase that brings up some new thought on the subject.

ROAD SHOW

Road Builders Dramatize Progress 140

P. M. Heldt spent some very profitable time at the annual show and convention of the Road Builders Association. He gleaned out all of the developments that were of automotive interest and tells about them.

SIGNALS

Direction Signals for Motor Vehicles 146

At the Buick plant a new and different direction signal has been evolved. How it works, how it is made and how it was designed with all the answers to why's as well is told in this article which not only covers this particular design but is highly enlightening on the subject in general.

FUELS

How to Use Gasoline to Best Advantage 156

Here is a discussion of engines and gasolines that points the way toward more efficient motor fuels.

PRODUCTION

Gears of Iron Powder 158

The Moraine Products Corp. are doing some interesting things in the production of small gears by this new method. The advantages of this type are discussed, and pointed out not only from the manufacturing point of view but the user's as well.

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Since 1913 all issues of AUTOMOTIVE INDUSTRIES have been indexed in the *Industrial Arts Index*, which can be consulted in any public library.

February 15, 1940

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AUTOMOTIVE INDUSTRIES

Published on the 1st
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Vol. 82, No. 4
February 15, 1940

Do We NEED the Wagner Act? Let's Find Out

IN HIS testimony before the House Committee, which is inquiring into the effects of the National Labor Relations Act and into the Labor Board's interpretation and administration of that law, Dr. William M. Leiserson, the most recently appointed member of the board, made the following statement:

"It is, indeed, regrettable that we should ever have reached a condition that made it necessary for Congress to enact the National Labor Relations Act. Most of the great industrial nations of the world do not have any statutes of this kind. The reason is, apparently, that in those countries it did not occur to the great body of employers that they had the right to deny to their employees the freedom of organization which they claim for themselves."

Congress did, for one reason or another, pass the National Labor Relations Act. There can be no doubt about that. But there can be, and unquestionably is, an honest doubt as to whether it was necessary, from any nationally important viewpoint, for Congress to do so. There is, furthermore, a widely held and well grounded doubt as to the desirability of that action. Certainly, on the one hand, there are few conspicuous and generally acknowledged benefits that have measurably accrued to the advantage of the country as a whole during the four and a half years that the Act has been "a part of our substantive law." On the other hand, there have been so many and such conspicuous results that have unfavorably affected our national economy and our general well-being that Congress has found it desirable to make a special investigation to determine what is wrong with the Act and the manner in which it is being enforced. About the necessity for this later Congressional action with respect to the Wagner Act there is much less doubt than there is regarding the necessity for adopting the law originally.

Doctor Leiserson indicates why he thinks it was necessary for Congress to pass the

National Labor Relations Act. He implies that, generally speaking, employers in this country have denied their employees the freedom of organization which they have claimed for themselves while those in other great industrial countries have not, with the result, assumably, that organization of labor here has been impeded to an extent that is detrimental to our national welfare. That would be a broad generalization. It is partly true. But is it wholly true? In the first place, there are room and reason for a substantial doubt

Trial by Or-deal Modern Style



Courtesy, The Omaha World-Herald

that employers generally in other great industrial countries accepted unionism with the avidity suggested. Unionism, as history shows, did not always find easy going in other lands and yet, as Doctor Leiserson says, most of them have no Wagner Acts or ever had them. Unionism won its way in other lands without the help of Wagner Acts, without government pressure to extend unionization. Possibly it was not so much because of a markedly different attitude on the part of industry as because of a commendably different attitude on the part of the leaders and the rank and file of organized labor.

In the second place, unionism in this country has obviously made fairly steady progress during many years passed, with the usual and to be expected ups and downs, to the point where it has, in itself, become big business. Surely it cannot be said that unionism in America was strangled in its crib by the crushing hand of industry. It seems instead to have thrived through the vicissitudes of youth and to have attained, some time ago, the stature and the potency, even if not the responsibility, of manhood. It has rolled up an accumulated political power sufficient often to have a determining effect on Congressional action. Would we have had the Wagner Act, to pick one of many possible examples, if labor organizers, not wanting it as an aid in driving more workers into dues-producing unionism, had opposed it? What is there, moreover, to show that a further extension of unionism would, in the long run, be to our national benefit? It is possible that it might be, but support for the contention still lies largely in the realm of theory and speculation.

Industry in America has undeniably manifested a reluctance to accept unionism. This fact makes it pertinent and important, in considering labor legislation, to inquire why this reluctance has been shown and to uncover not just some of the reasons, as was done, but all of them. Even if it had been decided on pure assumption that complete or more nearly complete organization of labor in our industry would be nationally beneficial, it would have been a more intelligent procedure for Congress, before

passing the Wagner Act, to have been more resistant to the pressure of professional labor organizers, to have inquired more deeply and with methods that cannot be employed effectively in open hearings into the causes of this reluctance, and to have learned with greater exactness to what extent, relatively, industry and organized labor are responsible. Unionism has given industry many good reasons for being reluctant to climb into bed with organized labor. At least it can be said that it certainly has not made the prospect of bed-sharing irresistibly alluring.

After such a deeply searching and scrupulously impartial investigation as the proposal of the law demanded, if there was blame to be allotted, it undoubtedly would not have been placed entirely on industry. Right here is where the Wagner Act falls down. It is a blatantly implied and deeply resented indictment which has the sting of rank injustice.

What did the National Labor Relations Act add to the law of our land? Basically, it added almost nothing new in principle. For the most part, except for its prescribed administrative procedure, it merely restated principles of long and historic standing, together with certain of their corollaries which seem almost obvious even to the untutored layman.

"Employees," says the law, "shall have the right to self-organization, to form, join, or assist labor organizations, to bargain collectively through representa-

tives of their own choosing, and to engage in concerted activities, for the purpose of collective bargaining or other mutual aid or protection." In this country they have always legally had that right. It almost goes without saying that as they have that right it is illegal for anyone to interfere with it. That fact was known to our law-enforcing agencies long before the Wagner Act was passed and, if the right was infringed, it was not because of the lack of basic law proscribing such infringement. While it may have been difficult sometimes to uphold the right, it is just as difficult to uphold others of our rights, inalienable or otherwise, which, individually at least, we feel are equally important. (Turn to page 159)

The Brass-Hat Rack



"We can get 'em for \$2 less per car if we mount 'em that way!"

Bob Brown.

BUSINESS IN BRIEF

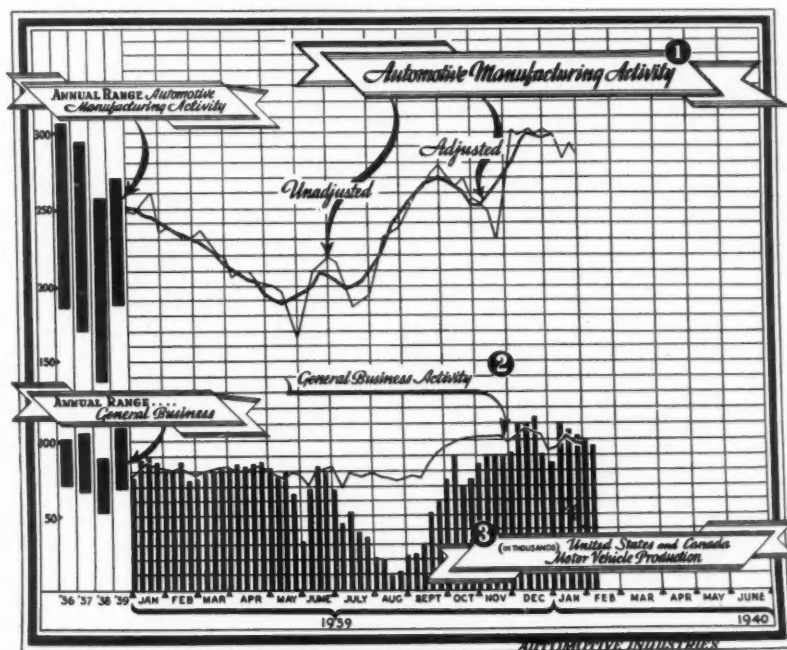
*Our own view of automotive production and sales;
authoritative interpretation of general conditions*

PRODUCTION of cars and trucks during February is expected to be somewhat lower than the all-time January record established last month but, according to an early check of manufacturers' schedules, the decline probably will be less than seasonal and also will be attributable to the fact that the current month has two less working days.

Production for the week ending Feb. 10 was expected to total several hundred units over 96,000^a cars and trucks, and this rate appeared to be close to the figure anticipated for the week ending Feb. 17. Based on current daily rates, which have been trimmed slightly by the major producers from those in effect in January it is estimated that total February production will be between 385,000 and 390,000 units which would make the month the best February in the industry's history since 1929. Further trimming of schedules by some producers before the end of the month, always a possibility, could place the February total slightly below the month's 1937 record which totaled 383,900 units.

Most of the General Motors divisions have trimmed their weekly rates slightly for February as have most of the independents. Chrysler divisions, still operating at a high rate in effect since settlement of their strike, were expected to continue with only slight downward revisions and Ford plants also appeared to be planning to run along at rates approximately equal to those maintained since the first of the year. Although official figures on January production will not

^a1923 average = 100; ^bPrepared by Administrative and Research Corp., New York. 1926 = 100; ^cEstimated by J. A. Leansma, Detroit News Editor, AUTOMOTIVE INDUSTRIES.



**Weekly indexes of automotive general business
charted**

Record February Seems Likely

be available until later in the month it appears that preliminary estimates were a little high when compared with the January estimate issued by the Automobile Manufacturers Association which placed the monthly output at 453,000 cars and trucks. Even with this somewhat lower figure, January production still stands at a new high for the industry as the highest previous January was in 1929 when 422,538 cars and trucks were produced.

Early reports on January sales indicate that the production record was based on continued

good activity in the retail field. Buick and Pontiac reported the best January in their history and Chevrolet sales were the second highest January in their history, being surpassed only by January, 1936. Buick sales for the month showed a less than seasonal decline from December of 25 per cent against an average decline of 38 per cent. The company began February with a backlog of orders that was 64 per cent greater than last year. Chevrolet sales of cars and trucks totaled 73,326 units and during the same month dealers moved 118,272 used vehicles.

AUTOMOTIVE MANUFACTURING ACTIVITY, as indicated by the unadjusted index charted herewith, continues in the mood established over the past couple months of minor increases or decreases from week to week. During the week ended Jan. 27 the unadjusted index climbed nine points to reach 292, then it dropped off eight points the week ended Feb. 3 to 284. The laggard curve which passes through the adjusted index levels stood at 296 the week ended Jan. 6 and at 298 the week ended Jan. 13.

BUSINESS ACTIVITY

Road



One of the new International Harvester TracTractors shown pulling a road-building machine

MANY manufacturers of motor trucks, tractors, and automotive and industrial power units and parts were exhibitors at the annual show of the American Road Builders' Association, which was held at Chicago Jan. 29 to Feb. 2, inclusive. The principal exhibits at the show, of course, were machines employed in building highways, such as scarifiers, scrapers, power shovels, bulldozers, paving machines, graders, ditchers, etc.; but all of these require power to operate them, and, besides, many of them are self-propelling—hence the interest of the show from the automotive standpoint. Roads, moreover, are built by contractors, who also engage in other lines of construction work, and the exhibits included a certain amount of machinery employed more in other lines than in road building. The number of exhibitors was in excess of 200.

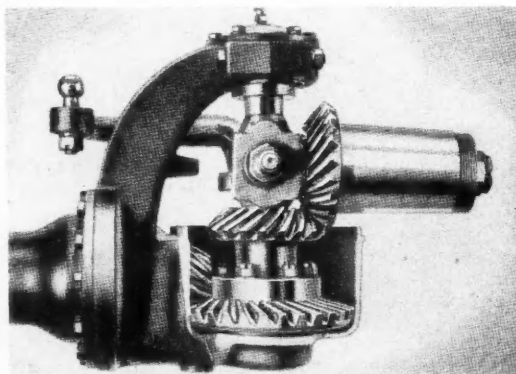
Simultaneously with the show, the American Road Builders' Association held its annual convention. The show was staged in the huge International Amphitheater on Chicago's South Side, and most of the sessions of the convention were held in the Stock Yards Inn, a building located in the same block. Road officials and contractors from all parts of the nation and from many foreign (chiefly Latin-

American) countries were in attendance in large numbers, and hotel accommodation in Chicago was at a premium. An interesting feature of the event was an exhibit illustrating 25 years of progress in highway construction, which included numerous large-size

photographs of highways in every state of the union, taken in 1914 and 1939, respectively. Of one of the largest projects now under way, the Pennsylvania Turnpike (Harrisburg to Pittsburgh), both a large-scale wall map and a model on a circular foundation were shown.

The attendance was all that could be desired, and at

certain times of the day it was difficult to make one's way through the crowds which thronged the stands and aisles. A number of exhibitors made use of loud speakers to propound the virtues of their products, while others operated their machines to demonstrate the controls, and in the street-level halls, at least, there was plenty of commotion throughout the day.



Asam front-wheel drive—a conversion unit for Chevrolet trucks

Builders Dramatize Progress

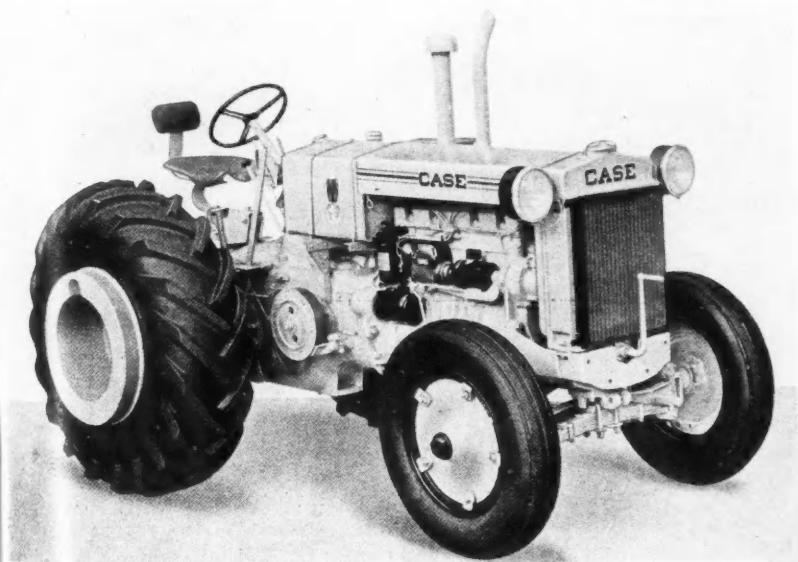
***of highway construction at annual show and convention
Automotive equipment dominates the show with Diesel powered units more conspicuous in the larger types***

In looking over the tractors adapted for heavy construction work—most of them of the crawler type—one was impressed with the fact that whereas farm tractors have been getting smaller in recent years, these industrial tractors are constantly getting bigger. In order to make it possible for the farmer to replace horses with it, the farm tractor must be adapted not only to plowing, but also to row-crop cultivation and other light work, and this led to the development of the all-purpose tractor, which is considerably lighter than the average farm tractor of a decade ago. In road building and other contracting work, on the other hand, the problem is to move dirt rapidly and *at low cost*, and this encourages the use of large units. Formerly this work was done almost exclusively with power shovels and dump trucks, but in recent years a new type of machine, sometimes referred to as a carry-all, has come into use. These machines have a body in the form of a huge shovel which can be lowered by power so its forward edge rests on the ground, and a shutter at the forward edge is then raised to open the shovel. The latter is then filled with dirt by moving the machine forward, either by applying power to its own wheels, or by pushing or pulling it with a tractor. Next the shutter at the front is forced down to close it, and the entire shovel with its load of dirt is raised off the ground by power and can be moved

wherever the dirt is wanted. As the machine is equipped with pneumatic tires, it can be returned to the scene of operations at speeds up to 25 m.p.h. Unloading also is effected by power, the contents of the shovel being either dumped or pushed out after the shutter at the front has been raised.

That these machines are still in the early developmental stage is indicated by the multiplicity of the types of control employed on them. These include mechanical controls by means of gears and shafts, or by cables, and also hydraulic and pneumatic (compressed-air) controls. Wherever very large units are involved, power control has its appeal, and the field for such controls in modern road-building machinery was emphasized by an exhibit of hydraulic control systems by Vickers, Inc.

A good deal of interest centered in the largest machine of the carry-all type, exhibited by R. G. Le Tourneau, Inc. Its shovel or body had a capacity of 33.3 cu. yds. when leveled off, and 45 cu. yds. when heaped. It was carried on six pneumatic tires, 105 x 32.00 in., inflated to 45 lb. per sq. in. (and costing \$2,300 each, so it was said). The weight of this carry-all, empty, was 79,700 lb., and the machine was designed to be operated by two Diesel tractors (Caterpillar), a 160-hp. pulling and a 95-hp. tractor pushing it. The maximum propelling effort available at the wheel rims was said to be 30,800 lb. Another large machine of this general type, described as a cable scraper, of 25 cu. yds. capacity heaped, was exhibited by Gar Wood Industries, Inc.



Case Model LIH tractor equipped with fuel-injection, spark-ignition engine

It is worthy of note that practically all of the new large industrial tractors, and nearly all of the self-propelling carry-alls and power shovels shown were equipped with oil engines.

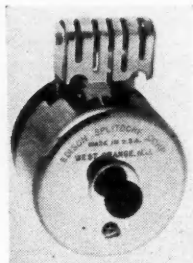
International Harvester Company, at a luncheon given at the Stock Yards Inn, announced that it has entered the industrial power field in earnest, having added three new models of TracTracTor crawler-type tractors, which gives it a line of four such tractors. The company, it was said, felt itself well equipped for this line of activity, by its nation-wide, and even world-wide sales and service organizations. The three new models are smaller than the original TracTracTor, the Model TD-18, brought out about a year ago. All four are powered by Diesel engines of the company's own make, which are started as gasoline engines and switched over to Diesel fuel and operation on the Diesel cycle as soon as they have been brought up to speed. Belt and drawbar horsepowers of the four models are as follows:

International Harvester TracTracTor Models				
Model	TD-6	TD-9	TD-14	TD-18
Belt hp.	36	46	64	84
Drawbar hp.	30	38	53	70

The two smaller tractors have five forward and one reverse speeds; the two larger, six forward and two reverse. The lowest speed in each case is 1.5 m.p.h., and at this speed the tractors are capable of maximum drawbar pulls of 6500 to 18,973 lb. The general design follows that of the Model TD-18, which is already well known. As will be seen from the photograph of one of these tractors hauling a road-building machine, considerable effort has been made to give the tractors—and particularly the enclosure of the powerplant—an attractive appearance.

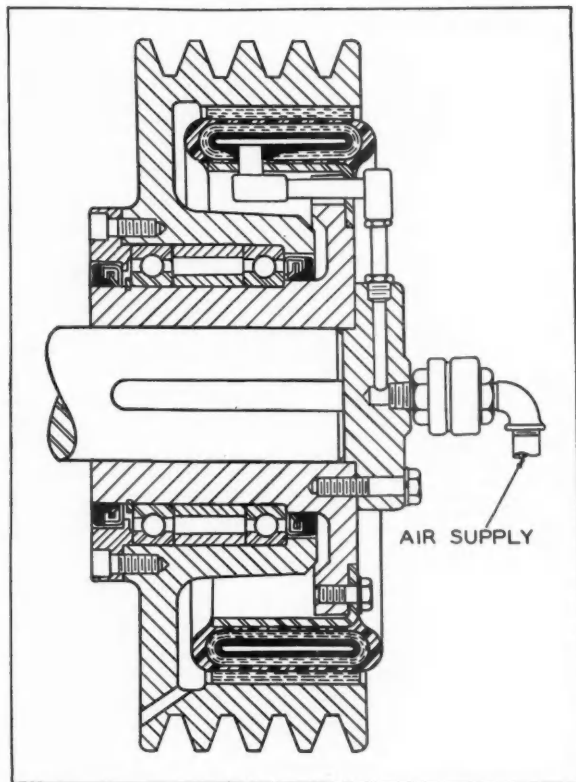
Caterpillar exhibited its latest Diesel tractor, the D7, equipped with a four-cylinder 5¾ by 8-in. engine governed at 1000 r.p.m. The belt hp. rating is 87 and the drawbar hp., 75. Five forward and four reverse speeds are available, and the forward speeds may range from 1.4 to either 5.0 or 6.0 m.p.h. In low forward speed the maximum available drawbar pull is 20,100 lb., while in high gear it is 4700 lb. with the low gears in the transmission, and 3500 lb. with the higher gears.

The new Caterpillar D7 replaces an older model of approximately the same capacity. As compared with the older model, it is of stronger build and more powerful, has an improved engine and a wider range of speeds, is more accessible, has better visibility and provides more comfort for the operator. The new engine is effectively sealed against dirt and is provided with an oil cooler; it is more accessible than the previous design, and is said to be able to burn successfully a wide range of Diesel fuel. With five forward speeds the engine power can be used to best advantage in almost any kind of operation. For each of the first four forward speeds



Edison switch and indicator for glow plugs

February 15, 1940



Sectional view of Airflex friction clutch

there is a corresponding but slightly higher reverse speed, which is obtained by means of a quick-shifting reverse lever. This is independent of the regular shift lever, and makes it possible to shift from any of the first four forward speeds into the corresponding reverse speed by the operation (after clutch release) of a single lever—a feature said to be particularly valuable in connection with a bulldozer. Increased strength has been gained by extensive use of welded construction, as in the frame and steering-clutch case, which form a one-piece unit. Main and steering clutches are provided with metallic facings, which make adjustment unnecessary and increase clutch life.

In order to simplify and facilitate service operations, the steering clutches have been made individually removable from the top of the case, and the transmission gear also can be removed without disturbing the final drive or steering clutches. Connecting-rod bearings can be inspected and replaced through the side of the crankcase, and the main bearings (of the precision type) can be replaced without removing the engine from the tractor. The tractor has what is described as finger-tip steering, the steering clutch being controlled by means of a hydraulic mechanism worked out by Caterpillar itself. This mechanism comprises a separate control unit driven from the upper transmission shaft. All the operator has to do is to open and close the control valve. Other features on which special emphasis is placed by the makers are excellent visibility and a comfortable and durable seat.

One of the surprises of the show was the information that the Allis-Chalmers Co. had abandoned its fuel-injection, spark-ignition engines, and had adopted

the General Motors two-stroke Diesel engine instead. Among other types, the company exhibited the new Model HD-14, which is equipped with a six-cylinder G.M. engine and has ratings of 130 belt hp. and 108 drawbar hp., the engine being governed at 1500 r.p.m. The shipping weight of this crawler-type tractor is approximately 27,800 lb. The transmission affords six forward speeds ranging from 1.72 to 7.00 m.p.h., and two reverse speeds, of 2.00 and 3.20 m.p.h. Drawbar pulls range from 24,600 lb. in low gear to 4500 lb. in high gear. Steering of the tractor is effected by means of multiple-disk clutches, of 3141 sq. in. total friction surface each, faced with bi-metallic material.

This tractor has a tread of 68 in. (center to center of tracks), and the length of each track on the ground is 85 7/16 in. The standard shoe is 22 in. wide, and there are 35 shoes in each track. The ground pressure is 7.39 lb. per sq. in. Standard equipment of this model includes a full-width crankcase guard, a heavy radiator guard, an adjustable radiator shutter, a bumper, a front pull hook, and an electric starting and lighting system.

J. I. Case Co., Racine, Wis., in response to the demand for large industrial tractors with engines capable of burning low-cost Diesel fuels, has developed a fuel-injection, spark-ignition engine of its own, on the Hesselman principle, and exhibited a 56-hp. tractor with this type of engine. The company also added two models to its line of agricultural tractors, which now includes five models with ratings ranging from 13 to 40 belt hp.

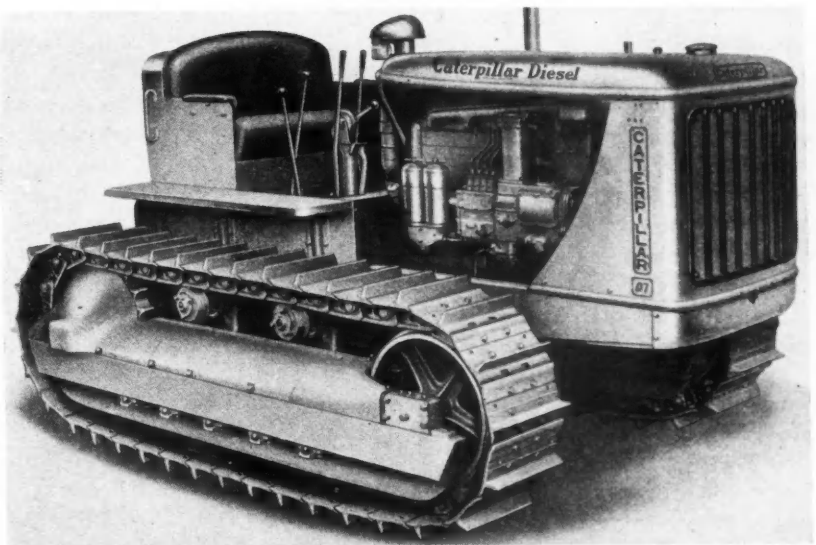
The Case oil engine tractor, the Model LIH, is of the four-wheel type and carries a four-cylinder engine of 4 5/8 in. bore by 6 in. stroke (403 cu. in.), which is said to develop its 56 hp. complete with all accessories, such as fan, water pump, air cleaner and governor, at 1100 r.p.m. Removable cylinder liners are fitted, and have a honed finish. Fuel filtering is accomplished in three stages. First the fuel is passed through an edge-type filter, which is easily serviced; the second filter is of the replaceable cotton-waste type, while the third is of the replaceable paper cartridge type. Two fuel-filter gages are mounted on the dash; a vacuum gage indicates the condition of the first- and second-stage filters, while a pressure gage shows the condition of the third-stage filter. Ignition is by means of a high tension magneto with automatic impulse coupling. There are four forward speeds, which at 1100 r.p.m. of the engine range from 2.54 to 12.64 m.p.h. Front tires are 32 by 6-in., high-pressure; rear tires, 11.25 by 28-in., low-pressure.

While most of the tractors that have been briefly described in the foregoing are of the heaviest and most powerful type, tractors of all sizes were exhibited. Considerable interest was shown in operating sickle bars for mowing grass and weeds, through a power take-off from the transmis-

sion of the tractor. Most of the exhibitors of such appliances emphasized their use in mowing road sides, no doubt because they expected many highway maintenance officials at the show, but such appliances evidently can be used equally well for mowing grass on the farm. Of course, in mowing roadsides, the sickle must be able to function not only in a substantially horizontal position, but also at large inclinations in both directions, in mowing banks and ditches. Sickle-bar attachments are available with either hand or power (hydraulic) lift.

An interesting tractor of the smallest type, generally referred to as garden tractors, was shown by Gravely Motor Plow & Cultivator Co., Dunbar, W. Va. This differs from most ordinary garden tractors in that the implements are secured to the tractor ahead of the single wheel. The tractor has a single-cylinder, air-cooled engine which drives the steel wheel with driving lugs through a cone clutch and two-stage reduction gearing, the engine being located on one, and the clutch and transmission on the other side of the driving wheel. A good idea of the general lay-out may be obtained from the assembly drawing reproduced herewith. Among the implements that may be attached to this tractor are a 12-in. furrower, a cultivator with five 1 3/4 in. steels, a 30-in. power-driven rotary mower, a two-row seeder and marker, a 6 1/2-in. turn plow, and an 18-tooth peg-type harrow. The machine is provided with handles similar to plow handles, on which the clutch and engine controls are mounted.

A variation from this (the Model D), is the Model L Gravely tractor, which is specially designed for use on country estates. Instead of the single steel wheel with driving lugs, it has two rubber-tired wheels at the ends of a short axle on which the engine and transmission are mounted. There is a short forward extension from the transmission housing to which any of the various implements can be secured by means of four bolts. This model is as versatile as the Model D, as the implements which can be attached to it include a rotary plow, furrower, cultivator, sickle bar, rotary mower,



Caterpillar Model D7 Diesel Tractor

sprayer, roller, snow plow, and cart. Model L is equipped with a single-cylinder T-head engine with aluminum head developing 5 hp. at 1600 r.p.m., the bore and stroke being $3\frac{1}{4}$ by $3\frac{1}{2}$ in.

Mack Trucks, Inc., exhibited a new six-wheel bogie, the SW-30, adapted for trucks having a g.v.w. rating of 50,000 lb. Both axles of the bogie are driven, the drive being by dual-reduction gears (bevel and spur). In the design of this new bogie, the greatest possible simplicity was aimed at. There are no radius rods, either longitudinal or transverse, and no spring shackles. The bogie has two inverted semi-elliptic springs, which are the sole load-carrying and axle-positioning members. These springs, which are 5 in. wide each, have their ends carried in rubber shock insulators, and they are fastened to trunnions by clips provided with lips, which latter obviate the need for transverse radius rods. The horizontal driving couple has been canceled out by placing the trunnions below the wheel center. Brake thrust and driving thrust are taken on torque roads with universal joints at both ends. This arrangement, it is claimed, gives the same limiting braking effect and traction on all four wheels, as there is no transfer of weight from one pair of wheels to the other by the driving and braking torques. A very wide trunnion-support bracket prevents concentration of stress on the frame. The axle housings are massive, rigid steel castings.

Three differentials are used in this bogie. A Robbins power divider (which prevents loss of traction when one wheel gets onto slippery road surface) is located ahead of the forward rear axle, and there is a conventional differential in each of the two axles.

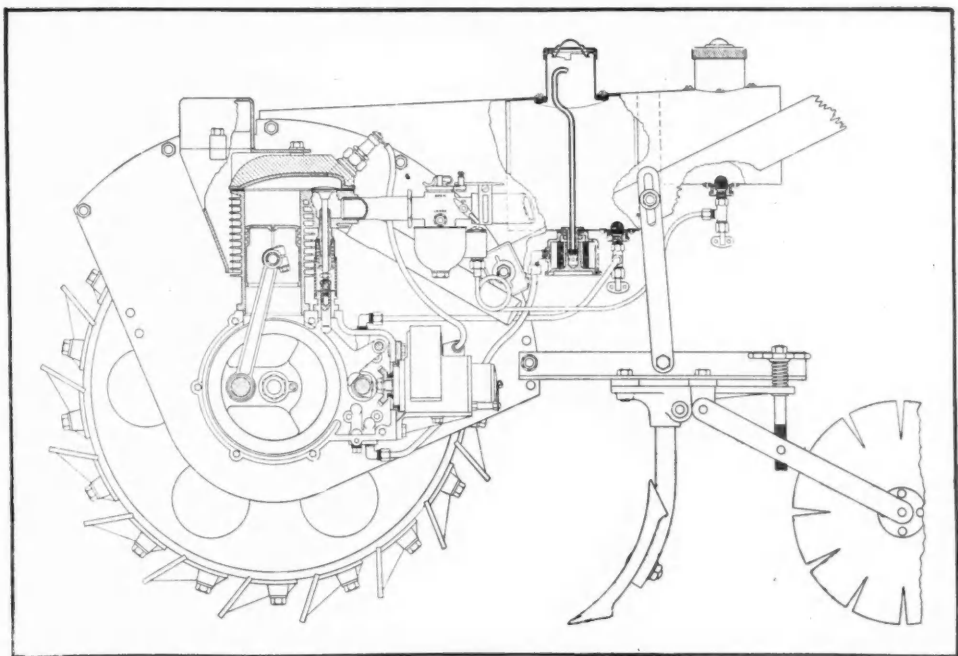
This bogie is designed for air brakes on all four wheels, and is equipped with four 9-in. "diaphragms" which act directly on slack-adjuster brake arms. The brake schedule is so laid out as to give equal response and equal pressure on all four diaphragms, air being admitted to the diaphragm chambers through a relay valve and not directly through the control valve.

Mack Trucks also exhibited what was claimed to be the largest enclosed-drive motor-truck axle, with axle shafts of $2\frac{1}{2}$ -in. diameter and designed for use on trucks with a g.v.w. rating of 50,000 lb.

A novelty on the stand of the White Motor Company was a heavy-duty, two-speed, double reduction, full-floating rear axle for use on trucks in the most severe dump and construction work. The first reduction is

by bevel gears, while each of the final reductions is by helical spur gears. Changeover from one to the other ratio is effected by means of a sliding clutch collar which is operated manually from the cab and locks one or the other of the final-drive pinions to the splined cross shaft. All carrier bearings are tapered roller bearings, which are lubricated by means of channels in the differential housing that guide the oil to them. The differential is partly immersed in oil, and is further lubricated by oil thrown off by the bevel gear.

This axle is said to be suitable for use with engines of from 362 to 529 cu. in. displacement, and to have a carrying capacity of 20,000 lb. Its two reduction ratios are 6.53 and 8.53. The housing is made of malle-



Assembly drawing of Gravelly garden tractor

able iron, heat-treated, and is provided with chrome-nickel-steel "carrying" tubes that are pressed in and locked. Axle tubes have an inside diameter of $2\frac{1}{4}$ in. and an outside diameter of 3 in. Driving gears are carburized and case-hardened. Pinions of the low- and high-speed gears have face widths of $3\frac{7}{8}$ in. and 3 in., respectively, and the gear face is $\frac{1}{8}$ in. less in each case. Axle shafts have a minimum diameter of $1\frac{5}{16}$ in., a diameter of $2\frac{1}{4}$ in. over the splines and are cut with 16 splines. Brake drums have a diameter of $16\frac{1}{2}$ in.; the molded brake linings are $\frac{3}{4}$ -in. thick and 6 in. wide, the total friction surface amounting to 415 sq. in. With wheels and drums, but without tires and rims, the axle weighs 1650 lb., and it has an oil capacity of 9.5 qts.

Two-speed rear axles offer particular advantages in heavy construction work, as they give additional ability when heavy loads must be hauled up steep ramps, and at the same time they enable the truck to

(Turn to page 164, please)

AUTOMOTIVE INDUSTRIES

Just among Ourselves

They Won't Buy Something They've Never Heard About

Our research department has just completed one of the most penetrating commercial surveys ever undertaken in the department. Its objective was a more complete knowledge of the use of synthetic rubber-like materials in fabricated units for original equipment on automobiles, trucks, tractors, aircraft and the other types of equipment produced within the automotive industry. Further, it sought to find out how many of the same parts utilizing s.r.-l. materials in original applications were found in the replacement market, and whether they were made for the replacement market by the same or different manufacturers. Then automotive wholesalers—the clearing houses of the replacement market—were asked to report the number and type of products on their shelves in which s.r.-l. materials were a factor.

Summarized, the survey paints a pretty complete picture of the flow into the automotive market of an important and comparatively young material, from the time it leaves the hands of the five original producers, through the fabricators to the parts' suppliers, to the vehicles, to the replacement parts' outlet. It's an extremely complicated flow, which made the data difficult to unravel.

The results, however, present some very instructive facts which are worth the attention of everyone who has a product to sell in the replacement field, no matter from what point of view it is offered.

First of all, let's have a look at the background data developed by the survey. It is apparent that s.r.-l. materials have played a larger part in the designing of original equipment than it has in the replacement parts field. In the passenger car field, out of 100 original equipment components which include s.r.-l. materials in the specifications, only 32 per cent are available for replacement, and only 10 per cent of these products are offered by manufacturers exclusively engaged in replacement part supply.

In the truck and bus field, reflecting increased emphasis on maintenance, 45 per cent of the 88 parts offered as original equipment are available for replacement, but the 10 per cent figure still holds on parts manufactured exclusively for replacement.

The aircraft field seems to be the largest relative

user of s.r.-l. materials. The survey lists 186 original equipment parts used in aircraft. Of these, only 12 per cent are available for replacement from the original manufacturer, and a lousy 1 per cent from replacement specialists.

It is very clear from the foregoing, that while the suppliers of s.r.-l. materials have done a fair job of educating manufacturers of original equipment in the virtues of the materials in resisting, heat, oil, and corrosion, they have been neglecting an important and profitable slice of the automotive market.

A thousand of the best automotive wholesalers in the United States got copies of the s.r.-l. materials questionnaire. The returns were high, but a surprising number of those who returned the questionnaire commented that they were not familiar with s.r.-l. materials and requested information of what they were.

In such cases where the wholesaler of automotive products displayed familiarity with the application of s.r.-l. materials in the goods on his shelves, there was very little recognition of brand name of the s.r.-l. material used—with one significant fact standing out: the best advertised brand was the one which turned up—almost exclusively in the brand-name-recognition column.

Synthetic rubber-like materials definitely belong in the class of new things that the public—and the trade—are interested in, and want to know more about. When such materials are designed into a product it should be worth the while of the sponsoring manufacturer to mention its special advantages in his advertising and sales promotion and personal missionary work.

This text is being preached on the basis of facts brought to light by a survey of one material, but it applies equally to many others which have a similar position in industry. When a product is ready for its trip into the hands of the ultimate consumer, through the normal channels of wholesaling and retailing, the heading on this homily covers every stage of the process. It applies to the wholesaler, to the retailer and to the final purchaser. Its corollary applies with particular force to the first two: "they won't push something they don't know about," and to the public in the form of "it's easier to sell me if I've heard of it before."

—HERBERT HOSKING.

Direction Signals for M

WHEN designing direction signals, one must think of the pedestrian as well as the motorist. Signals are needed for both the front and rear of the vehicle, and front signals for right and left turns

By HARRY C. DOANE*

must be so located that both are plainly visible to a pedestrian standing at an intersection, as well as to the approaching motorist.

Both front and rear signals should have sufficient brilliance to be visible at a distance of at least 100 ft. in bright sunlight. Front signals should be plainly visible when headlights are turned on. This emphasizes the need for a flashing signal, as a non-flashing light tends to blend with the headlight beam and to become ineffective. Often, sunlight reflected from adjacent, highly-polished parts will produce highlights of sufficient intensity to prevent signals from attracting attention if they do not flash. Moreover, the greater effectiveness of flashing signals has been proven by experience.

In addition to its obvious advantage of indicating the driver's intention to turn at an intersection, actual use has shown that the rear signal is quite effective when passing from one traffic lane to another, especially at night, when hand-signaling is of little use.

Many types of signals have been proposed, some of which are ruled out by excessive cost or other considerations, and this discussion is limited to the following three types, which are of practical interest at the present time:

(1) Signals embodying the use of arrows which may be of either the flashing or non-flashing type.

(2) Signals in which the stoplight, or other lamp, located at the outer extremities of the car, are caused to flash on that side of the car to which the turn is to be made. In the combination which utilizes the stoplight bulb for both stop and turn signal, the circuit arrangements are such that the opposite lamp is non-flashing if brakes are applied simultaneously with operation of the turn signal.

(3) Illuminated, semaphore-type, mechanically operated, and usually intended

*Paper by Harry C. Doane, electrical engineer of Buick Motor Division, presented at the S.A.E. annual meeting. Slightly condensed.

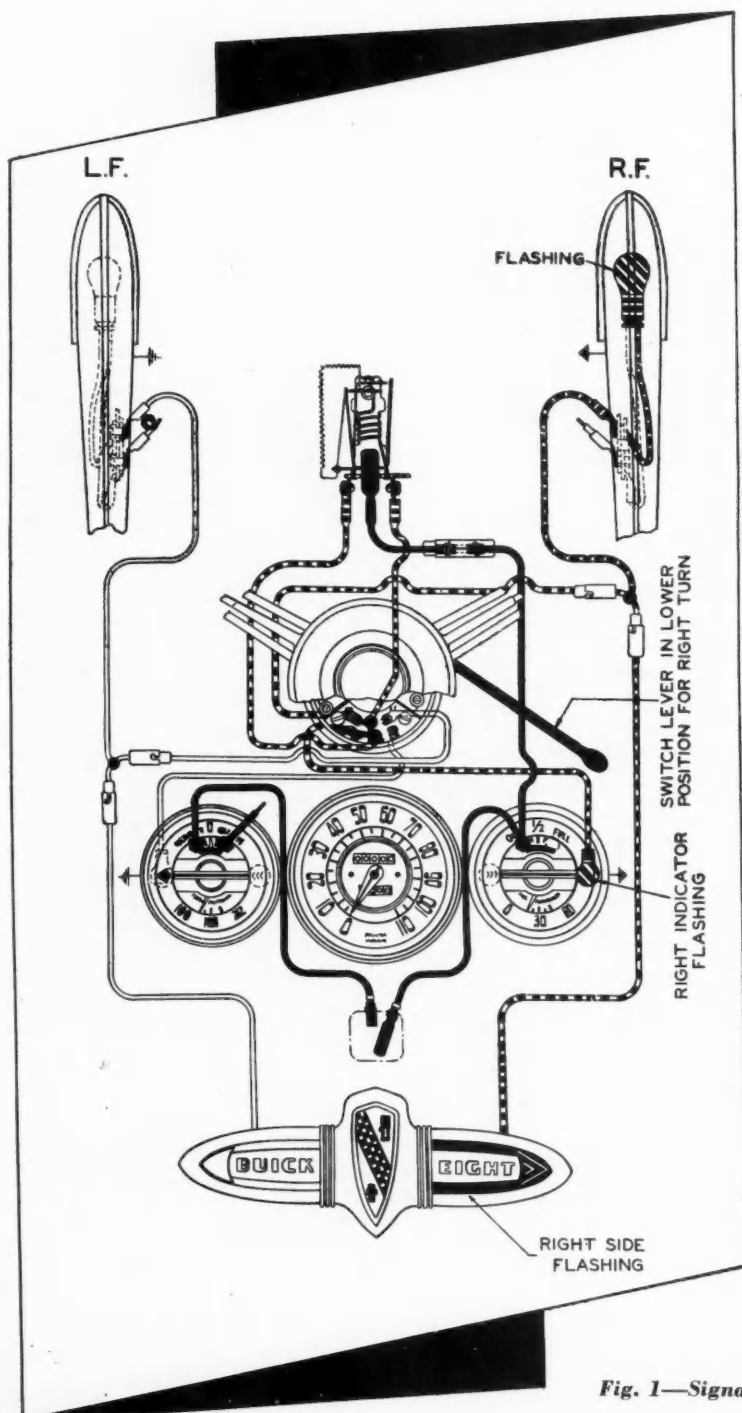


Fig. 1—Signal flasher and circuit as used on 1940 Buick

Motor Vehicles

to be seen from front and rear. Signals of this type have been popular on European cars for several years, but have aroused little interest here.

In initiating the use of direction signals for standard equipment on passenger cars, we at Buick were confronted with several problems—some of which will be of interest:

(1) Since none of the above signals had been in general use, it was felt that a system must be chosen that would carry an obvious meaning to the public. It was decided that this called for the use of arrows, and (as a result of experiments made) that the arrow should be caused to flash. A study was made of arrow shapes and the optics involved. The pattern chosen proved to be the most effective for the size and shape of the lamp.

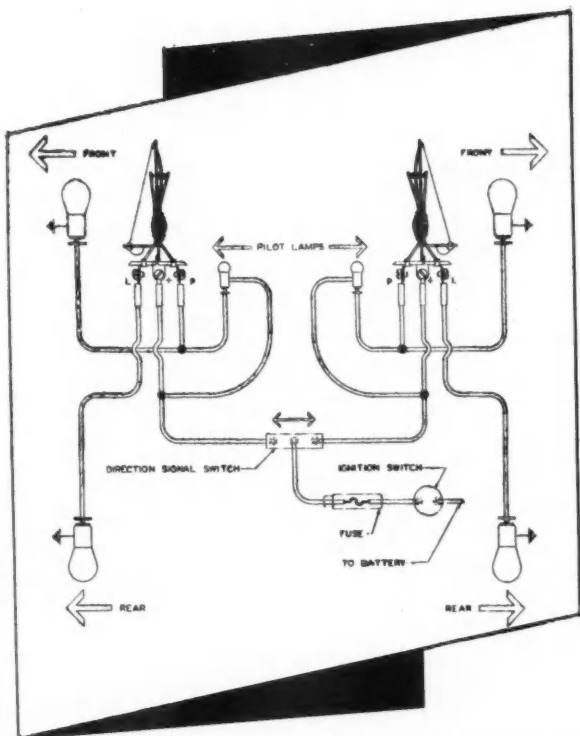


Fig. 2—An alternate arrangement using two pilot bulbs and eliminating the magnetic type

(2) It was necessary to provide a unit that would be acceptable in appearance. A design was worked out which harmonized with the car, and was somewhat unusual in that undue bulk was eliminated by placing the bulbs on the underside of the trunk lid, which was provided with suitable openings for illumination. It was further decided that this system would not only make its purpose obvious, but there were no ex-

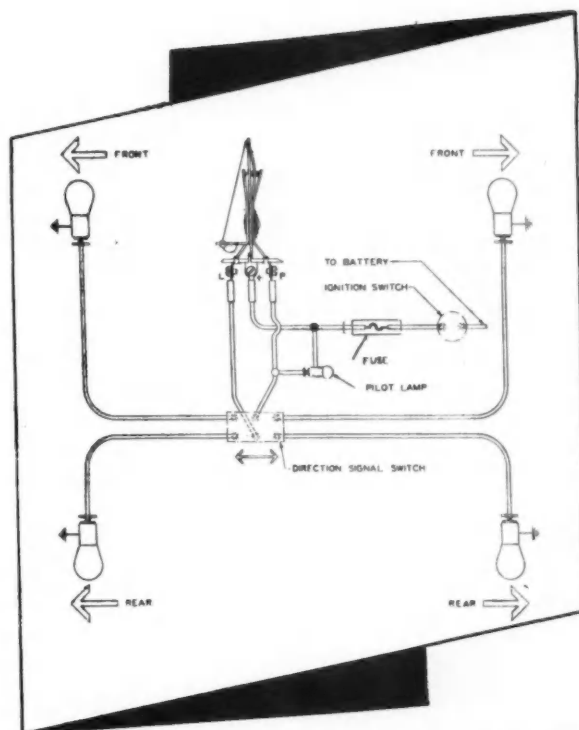


Fig. 3—Circuit of a simplified system using one pilot bulb in combination with a snap-spring hot-wire flasher

posed moving parts such as are present with the semaphore type, which might be affected by sleet and snow. It was reasonably economical and thus seemed to serve our purpose best.

Direction signals of this type now have been in general use for nearly two years, and other systems involving flashing of the stoplights at the extremities of the vehicle have also come into use. With this as evidence of the serious consideration that is now being given to this subject, it is felt that a standardization program should be initiated by the industry. This will prevent confusion and forestall unfavorable legislative action. It is proposed that the signals be placed as close as possible to the four extremities of the vehicle, whether arrows are used or not. Reactions recently obtained from several prominent enforcement officials have indicated a preference for the locations recommended, and for the use of arrows. The use of arrows, of course, requires separating the unit from the stop signal.

An important phase of this subject, and one that also should be given consideration in the standardization program, is the operation and location of the pilot light (or lights) which indicate to the driver whether or not the front and rear signals are operating. This is being stressed for the reason that flasher designs

have been proposed in which a failure of one of the signals would be indicated only by a speeding up or slowing down in the rate of the flash. Inasmuch as there are other factors that also change the rate of flash, such as the voltage, which varies with the engine speed, it is suggested that only flasher designs be considered with which the pilot bulb does not light whenever either the front or rear signal bulb is burned out.

Experience has shown that a means to indicate to the driver the direction in which his signals are operating is desirable. This can be accomplished mechanically by a suitable indicator on the switch lever, or, better, by two pilot lights operating behind arrows on the instrument board. Upon the choice of these principles depends the type of flasher to be used.

Fig. 1 illustrates the flasher and circuit used on the 1940 Buick signal. It is of the combination magnetic-and-hot-wire type, flashing both front and rear signals simultaneously. Separate contacts controlled by the magnet are used for operating the double pilot bulbs, which indicate by the absence of flashing when either the front or the rear signal bulb is burned out. The double pilot lights placed behind arrows in the instrument cluster serve to indicate to the driver the direction in which the signals are operating. This unit has proven very dependable, and the arrangement has served the purpose well.

Fig. 2 illustrates an alternative means of operating two pilot bulbs. Although this flasher is somewhat less expensive than the combination magnetic type described above, it requires the use of two units, since no relay circuit is provided for operating the pilot bulbs. As in the circuit shown in Fig. 1, the pilot bulb does not flash when either the front or the rear signal bulb is burned out. It differs in operation from Fig. 1 in that, if the rear-signal bulb burns out, the front-signal bulb continues to light, but does not flash. It is, therefore, perhaps not quite as desirable as the arrangement shown in Fig. 1, where the remaining signal continues to flash.

With this system both sides of the pilot light must be insulated. This requires a somewhat more complicated pilot-bulb arrangement than the magnetic type, where standard snap-type sockets can be used, since one side of the socket is grounded.

Fig. 3 illustrates a circuit for a simplified system, using only one pilot bulb in combination with a snapping hot-wire flasher. Operation is exactly the same as with the circuit shown in Fig. 2, except that the pilot bulb does not indicate the direction in which the signals are flashing. With this arrangement the pilot bulb should be located to illuminate a suitable mechanical indicator connected with the operating-switch lever.

Uniform operation of pilot lights is highly desirable, and suitable means for indicating which signals are in use should be provided.

Flashers calibrated to operate at between 90 and 100 flashes per minute at 6.5 volts give a satisfactory indication. A higher rate is not desirable, because under operating conditions the voltage may rise somewhat above 6.5, which increases the rate of flash and thus shortens the interval during which the bulb filament can lose brilliance.

One of the most controversial phases of this subject has been the manner in which direction switches should be turned on and off. The systems may be divided into the following groups:

(1) Straight manual operation, in which a conveniently located lever is turned on manually when approaching the turn, and turned off manually when the turn has been completed.

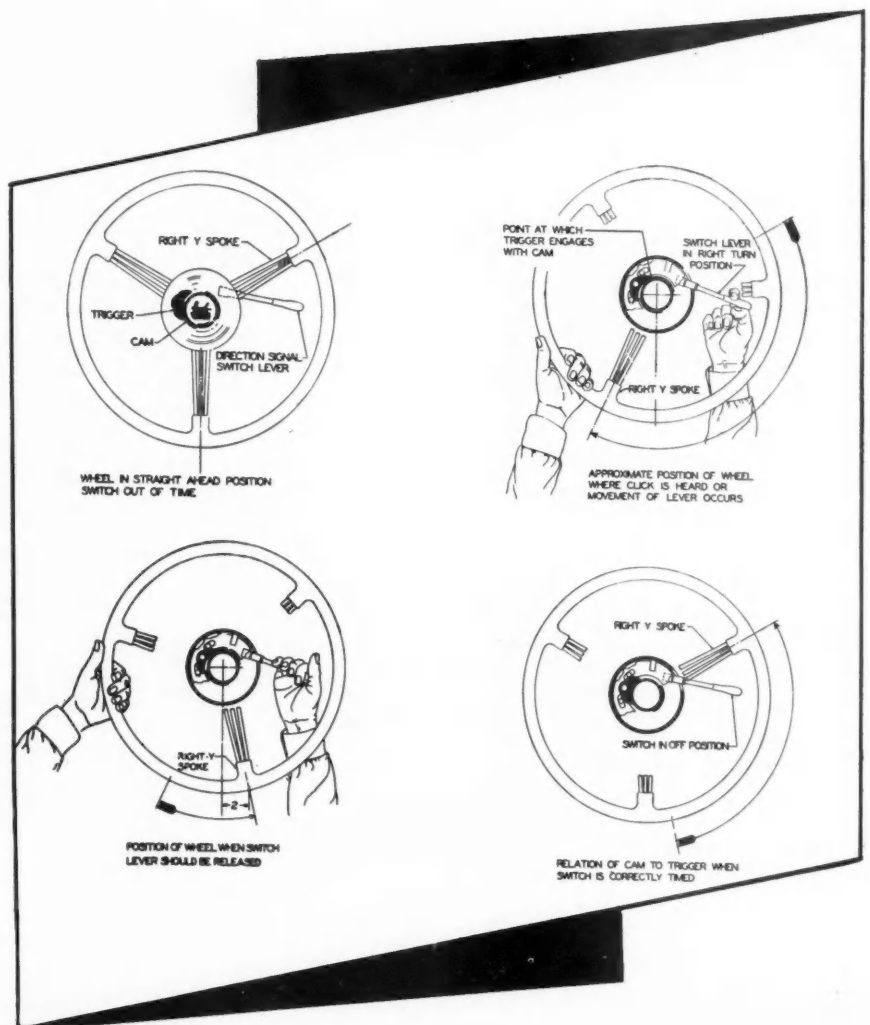


Fig. 4 — Illustrating method of timing switch

(2) Time-controlled relays, with which the signal is turned on manually when approaching a turn, and after a predetermined lapse of time, turned off automatically.

(3) Semi-automatic types, with which the signal is turned on by the manual movement of a conveniently located lever, and turned off automatically by the steering-gear mechanism after the turn is completed.

(4) Full-automatic and manual combination. This type can be turned on manually when approaching a turn and, if not turned on manually, will operate the signal while the turn is being made, and turn it off after the turn has been completed.

The undesirable feature of the straight manual type is that the driver frequently forgets to turn it off. This confuses other drivers and may add hazards instead of eliminating them. A thorough study of the various mechanisms led to the following conclusions:

(a) Straight - manually - controlled devices are unsatisfactory.

(b) Straight-time-controlled relays offer some advantages over manual operation. Driving conditions, however, affect the time required. Thus, if while driving at normal speed, the time is sufficient for signaling the proper distance before making the turn, it will not be correct if the signal is set while the car is idling at a street signal where the turn is to be made. Thus the signal may continue to flash long after the turn is made.

Systems have been advocated in which this condition is taken care of to some extent by controlling the timing device through the engine vacuum. Experience with several devices of this type have revealed many shortcomings. The ideal system would be one that is completely automatic in operation—but, of course, no device can anticipate the driver's intentions.

(c) An automatic system that functions as a result of movement of the steering apparatus does not allow sufficient time for those following to anticipate the driver's intentions. In fact, by the time the signal operates it is already apparent by the movement of the car that a turn is to be made. When such a system is combined with manual operation there is a definite tendency for the driver to neglect the manual setting and depend entirely upon automatic operation, which, as has been pointed out, is unsatisfactory.

There is one additional objection to mechanisms that are turned on automatically by steering-wheel rotation. If such devices are made sufficiently sensitive to close the signal circuit with the initial movement of the wheel, this occurs also when the car is being driven through traffic in passing around other vehicles, which tends to create confusion and to cause people to ignore direction signals altogether.

After carefully analyzing the requirements, it was decided that a system which could be turned on manually by the driver, and turned off by steering-wheel



Fig. 5—Parts and assembly of control switch

action after completion of the turn, would offer the best compromise. Accordingly, a system of this kind was developed. The following brief description of the construction and operation of this switch may be of interest.

The switch and turn-off mechanism are contained in a housing just below the steering-wheel hub, and the wiring is concealed by a metal cover which surrounds the steering-gear-mast jacket and transmission-control shaft. The manual-control lever has been placed on the right-hand side of the steering wheel just above the transmission shift lever. This position was considered to be most desirable, because both levers can be operated without removing the left hand from the wheel. When a right turn is anticipated, for example, the direction-signal lever is moved in the same direction that the wheel will be moved when the turn is made. With the lever in this position, it is possible to move the steering wheel through an angle of approximately 106-deg. to the right, and 77-deg. to the left. These are compromise angles arrived at experimentally to enable the driver to maneuver the car through traffic to the right-hand position for turning. In shifting the lever to this position, a double pawl is placed in position to engage with one of two notches on a frictionally-driven cam secured to the mounting hub of the steering wheel.

In rotating the wheel for the turn, the pawl snaps over the notches in the cam, but as soon as the turn is made and the wheel returns to the straight-ahead position, the cam notch engages the pawl, which results in returning the switch lever to the neutral position.

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New Developments in **AUTOMOTIVE**

New Pre-Finished Bonded Metals

Two new pre-finished bonded metals which are said to combine the attractive appearance and durability of nickel and chromium with the lightness, strength and workability of aluminum were recently introduced by the American Nickeloid Co., Peru, Ill. These two metals, designated by the manufacturer as Nickel Aluminum and Chrome Aluminum, are formed by a surface of chromium or nickel bonded by an electrolytic process to an aluminum base metal, using the Krome Alume process patent No. 1,971,761.

The pre-finished metals are available in sheets in sizes up to 36 in. by 96 in., in a full range of tempers, and in gages from 0.010 in. up to 0.064 in. Bright or satin finish and striped, crimped, or corrugated patterns can be supplied.

Both metals, the manufacturer claims, are easily workable during the manufacturing process, and are highly resistant to corrosion, rust or tarnish. They can be bent, stamped or moderately drawn without damage to the permanently bonded coatings that are guaranteed not to lift or peel from the base metal.

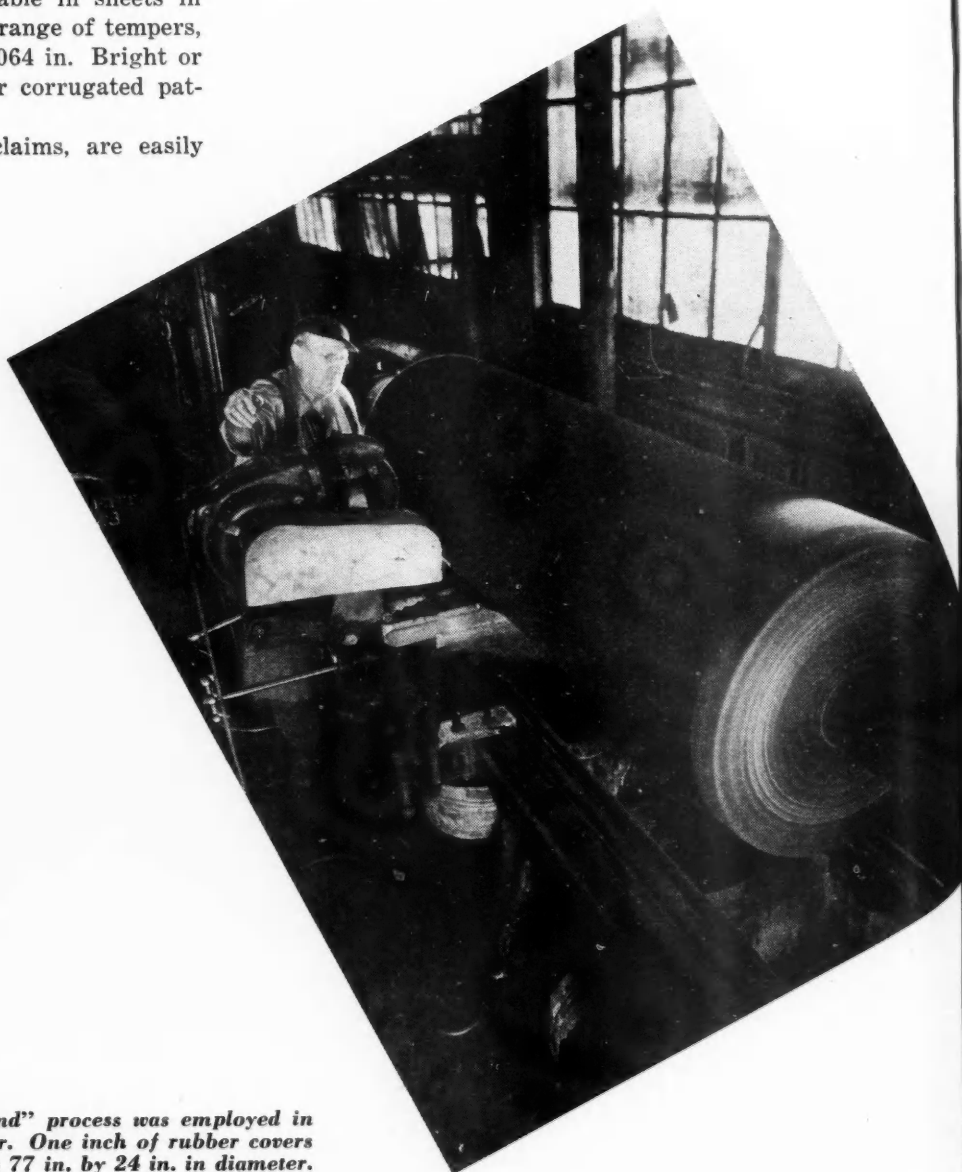
Bonding Soft Rubber To Steel and Aluminum

Successful development of a method for bonding soft rubber and Neoprene to steel and aluminum by hot vulcanization has been announced by the Hewitt Rubber Corp., Buffalo. The process is called "Dura-Bond" and eliminates the use of a hard rubber base next to the metal core and brass plating of the metal. It is said to produce an adhesion strength of 500 lb. to 750 lb. per sq. in.

and possesses remarkably good aging qualities.

With reference to the heat conditions for which the "Dura-Bond" process can be safely recommended, Hewitt limits its recommendations to temperatures up to 200 deg. Fahr. Efforts are being made to extend the range of temperature service conditions to at least 250 deg. Fahr.

Use of rubber-metal vulcanized combinations appears to be increasing rapidly in the automotive, transportation and mechanical goods industries. These products combine the abrasion and corrosion resis-



Hewitt Rubber Corp.'s new "Dura-Bond" process was employed in covering this steel cylinder with rubber. One inch of rubber covers the main body of the cylinder which is 77 in. by 24 in. in diameter.

MATERIALS . . .

tance as well as the sound-damping properties of rubber with the strength and rigidity of metal.

Lincoln Electric Develops A New Stainless Steel Electrode

A new stainless steel electrode intended for arc welding stainless steel of the 25 per cent chromium, 20 per cent nickel type, such as Iron & Steel Institute No. 310, has been developed by the Lincoln Electric Co., Cleveland. "Stainweld D," trade-name of the electrode, may also be used for welding various stainless steels to mild steel and for welding of steels which are air hardening and cannot be heat treated after welding.

Magalloy Frame Jig Used By Buick

For properly and accurately locating the powerplant in the frame on Buick 1940 automobiles, a fixture of extruded and cast Magalloy (magnesium alloy) has been developed. Use of the fixture results in correctly lining up the center line of the crankshaft with the propeller shaft and the procedure followed also in-

cludes a means of checking to determine that the rear mountings for the engine are of equal height.

Magalloy was selected for the fixture because it provided the proper amount of rigidity while at the same time being extremely light, the material weighing only two-thirds as much as aluminum and approximately one-fifth the weight of steel. It is also highly resistant to abrasion.

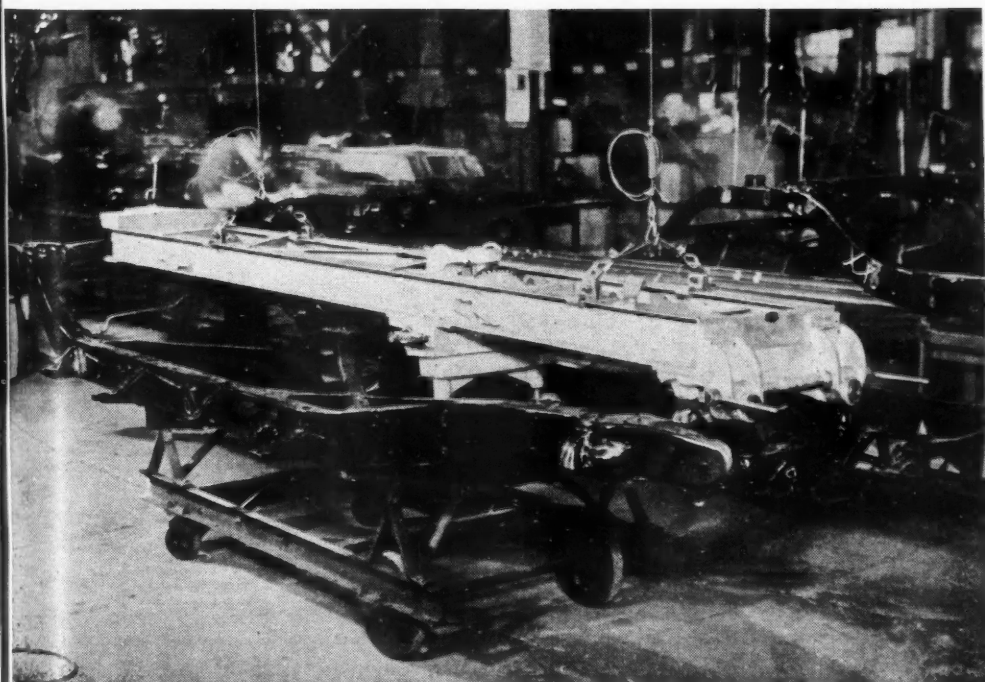
Flexible Bushing Developed By The Harris Products Co.

A form of flexible bushing, known as the "Torflex" bushing, has been developed by the Harris Products Co., Detroit, and increases considerably the scope of the Harris type of pivot bearing designed for axial compression. The Torflex bushing is manufactured under an exclusive license under the Welder patents, which are said to cover the stretching of a rubber or Neoprene tube between two metal tubes, with uniform pressure throughout the length of the tubing and with all fibers of the rubber under uniform stress.

It has been found possible to make up such assemblies in four-foot lengths, and to then cut them up to any required dimensions. An excellent form of rubber-backed bearing is said to be obtained by using

a brass or graphite-bronze tube as the inner member. This form of bearing can be produced at relatively low cost and has the advantages that it eliminates or reduces noise and compensates for misalignment. Several important passenger-car producers have adopted the latter form of bearing in their 1940 cars. One of them uses a bushing incorporating Neoprene, which offers advantages wherever the bearing is exposed to oil.

(Next page, please)



Oil Filter Manufacturer Used 7,000,000 lb. of Materials

An analysis of materials consumed during 1939 in the production of oil filters manufactured by Motor Improvements, Inc., Newark, N. J., shows that this company used over 7,000,000 lb. of raw materials.

The following materials made up the total: steel, 4,700,000 lb.; cotton cloth, 30,000 lb.; paper and boxes, 850,000 lb.; wool cloth, 5000 lb.; cotton waste, 300,000 lb.; castings, 500,000 lb.; die castings, 25,000 lb.; brass and fittings, 350,000 lb.; solder, 50,000 lb.; lacquer and thinner, 150,000 lb.; miscellaneous, 50,000 lb.

Nickel Steels in The Automobile

In his annual review of the nickel industry, President Robert C. Stanley of the International Nickel Company of Canada, Ltd., states that buses and trucks continue to extend their uses of nickel steels, because of the severe service and the insistence of owners on low maintenance costs. The competitive situation in the passenger car field in Canada and the United States continues keen. Labor costs have increased in the past year, but car prices generally have been maintained at more or less the same level, and material costs have been under pressure. A slightly lower quantity of nickel has been consumed per passenger car during 1939, though developments indicate an upward trend in the use of nickel steels.

In the racing field interest was aroused by two extremes of cars, i. e., John Cobb's giant racing car, powered with two Napier Lion 12-cylinder supercharged water-cooled engines each developing 1300 hp., with a total weight of about three tons, and the small 12 hp. M.G. car driven by Major Gardner. John Cobb at Salt Lake Flats increased the world's unrestricted record to 369.74 m.p.h., and, remarkable as was this achievement, it must be compared with that of Major Gardner, who, in his small six-cylinder (1086 cc) car, attained a speed of 203.16 m.p.h. on the special Autobahn at Dessau. Nickel alloy steels and light alloys were extensively used for all the highly stressed parts in both cars. They were likewise generously applied in the British 8 hp. class of car.

The value of nickel alloy steels in attaining maximum carrying capacity with the minimum of weight and, at the same time, the maximum of reliability is exemplified in the "Mammoth Major," an eight-wheel lorry having a maximum laden weight of 22 tons, made by one of the leading United Kingdom manufacturers.

In England a new light aluminum alloy, containing nickel, has been developed for bearings. After exhaustive road tests, this alloy is now being fitted to big-end and main bearings of automobiles and commercial vehicles.

The magnetic characteristics at low temperature of 29 per cent nickel-steel are utilized in generators and speedometers. Small pieces of nickel-steel operate at low temperatures to increase automatically the charging time of the generator or to correct the speedometer reading.

A United States automobile manufacturer has

adopted a so-called choke stove, which gives quick cold starting and permits a much shorter warm-up period. A tube of inconel runs through the exhaust manifold, where it is directly in the flame.

The use of over-drives is now standard equipment on several cars, where previously it was optional. This is resulting in an increased consumption of nickel because nickel steels are used extensively in these parts.

Increasing use of the track-laying tractor for mining, lumbering, farming, building, and manufacturing resulted in larger production in the past year.

The same alloy steels were adopted for the new models as those used in the old established models—principally nickel, nickel-chromium and nickel-molybdenum steels for such parts as transmission gears and shafts, bevel ring gears, sprocket shafts, bull gears, and bull pinions.

Output of wheel type farm tractors in Canada and the United States reached approximately 200,000 units for the year. Design trends continue along the lines of greater power, more speed and more silent operations, all requiring stronger materials. Several developments during the past year resulted in increasing the nickel content of the steels being used or changing the part from a plain carbon to a nickel steel.

A dozen new wheel-type models were introduced during the year. Of these new tractors, three were 15 drawbar hp., falling in the low-cost small-tractor group, which has become a field of increasing importance to the tractor manufacturer. Because of the substantial power developed in proportion to size, nickel alloy steels were generously used in two of the three models with satisfactory results.

The remarkable technical and commercial advances that have been recorded by the aviation industry during the past few years reached new heights in 1939. Indicative of present volume is the situation in the United States, where manufacturers had at the end of 1939 unfilled orders of over one-half billion dollars.

Some idea of the importance of this industry to metals is gained from the estimate that the United States manufacturers will have used in 1939 approximately 43 million pounds of metals and alloys. Large quantities of nickel-bearing ferrous and non-ferrous alloys are included in this.

In England and the United States over 500,000 lb. of inconel were consumed during the year. For horsepower over 1200, inconel is standard and, for smaller engines, a stabilized stainless steel containing upward of 8 per cent nickel is employed.

Nickel alloy steels are used for the spider and other parts of the modern controllable-pitch propellers and for vital parts throughout the powerplant where a high ratio of strength to weight is important. Nickel-chromium-molybdenum, steels, heat treated to high tensile strengths, are used for the structural parts of the undercarriage and 2 per cent nickel cast iron has proved itself for brakedrums on the landing wheels. Nickel stainless steel is being adopted for structural parts—at present largely in stabilizers, rudders and elevators.

Substantial quantities of non-magnetic "K" monel are used for instruments and for small structural and operating parts adjacent to the compass.

M. G. 1½-LITER ENGINE and TRANSMISSION

Longitudinal Section of Engine

For high-performance cars with open or closed bodywork of the sports type, the 1½-liter M.G. engine is similar in constructional features to the 10 hp. model, the racing version of which, with piston displacement reduced from 1292 c.c. to 1100 c.c., but supercharged, put the world's class records up to 183 m.p.h. in December, 1938, and to 203 m.p.h. in May, 1939.

As the accompanying drawings show, the 1½-liter is a four-cylinder engine with pushrod operated overhead valves. With a bore and stroke of 69.5 x 102 m.m. (approximately 2¾ x 4 in.), giving it a piston displacement of 1548 c.c. (94 cu. in.) it develops 55 b.hp. at 4400 r.p.m. The compression ratio is 6.4 to 1; b.m.e.p. is 128.5 lb. per sq. in. at 2500 r.p.m. and maximum torque 898 lb.-in. at 2600 r.p.m.

Both the cylinder head and the unit block and crankcase are in cast-iron with notably large water jackets; the oil sump is of aluminum, ribbed at the bottom for cooling. Water circulation is by centrifugal pump located in the cylinder block and driven by an extension of the ball-bearing fan shaft.

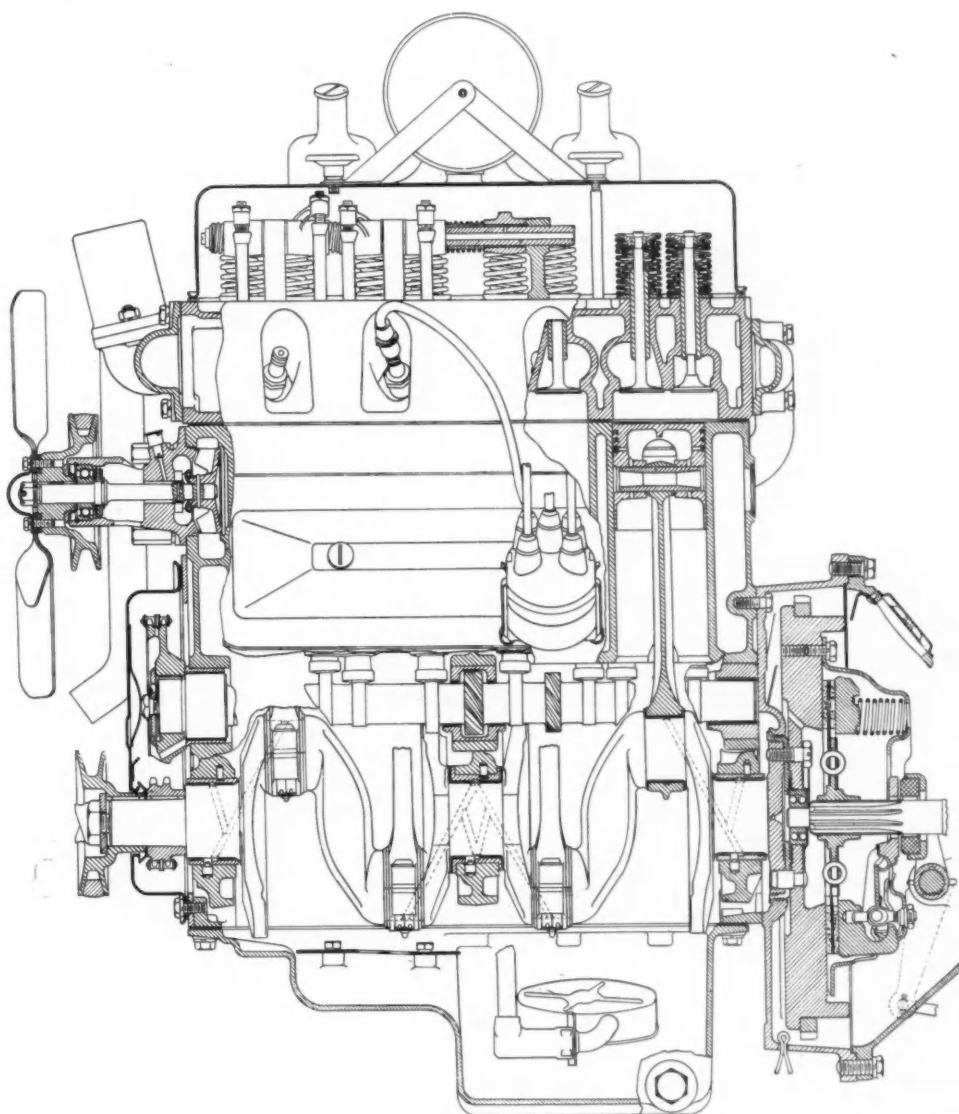
Distribution is by duplex roller chain to the camshaft only, the generator (voltage controlled and ventilated) being driven by the fan belt and its mounting providing for belt adjustment.

The four-bearing crankshaft is of unusually large diameter for an engine of this size, the journals being of 2⅞ in. diameter and the pins 1⅞ in. Journals are 40 m.m. in

length (approximately 1⅞ in.) and pins 30 m.m. (1⅜ in.). Connecting rods of steel have 8 in. centers, and the big ends, like the crankshaft bearings, have steel-backed white-metal liners. Pistons in aluminum (122 alloy heat-treated) have two pressure rings and one scraper. Wrist pins float in the piston bosses, but are clamped in the small-ends.

With a hollow rocker shaft for pressure lubrication of the rockers, the overhead valves have three concentric springs and are of silicon chrome, inlets of 34.5 m.m. diameter and exhausts 32 m.m.

Twin semi-downdraught S.U. carburetors are used

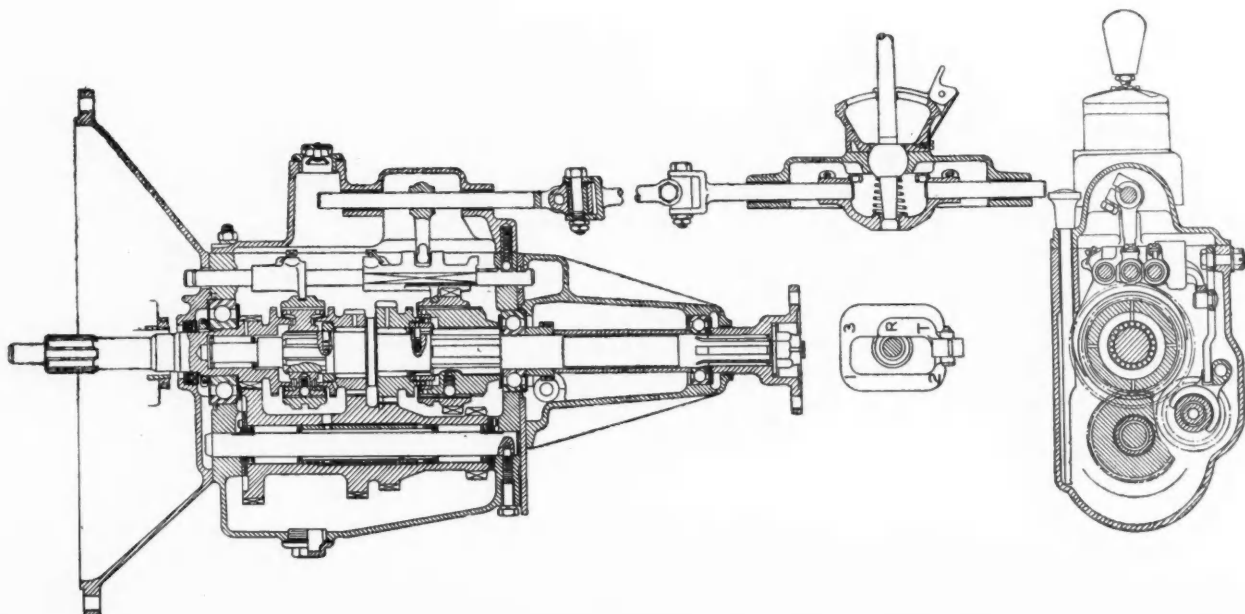
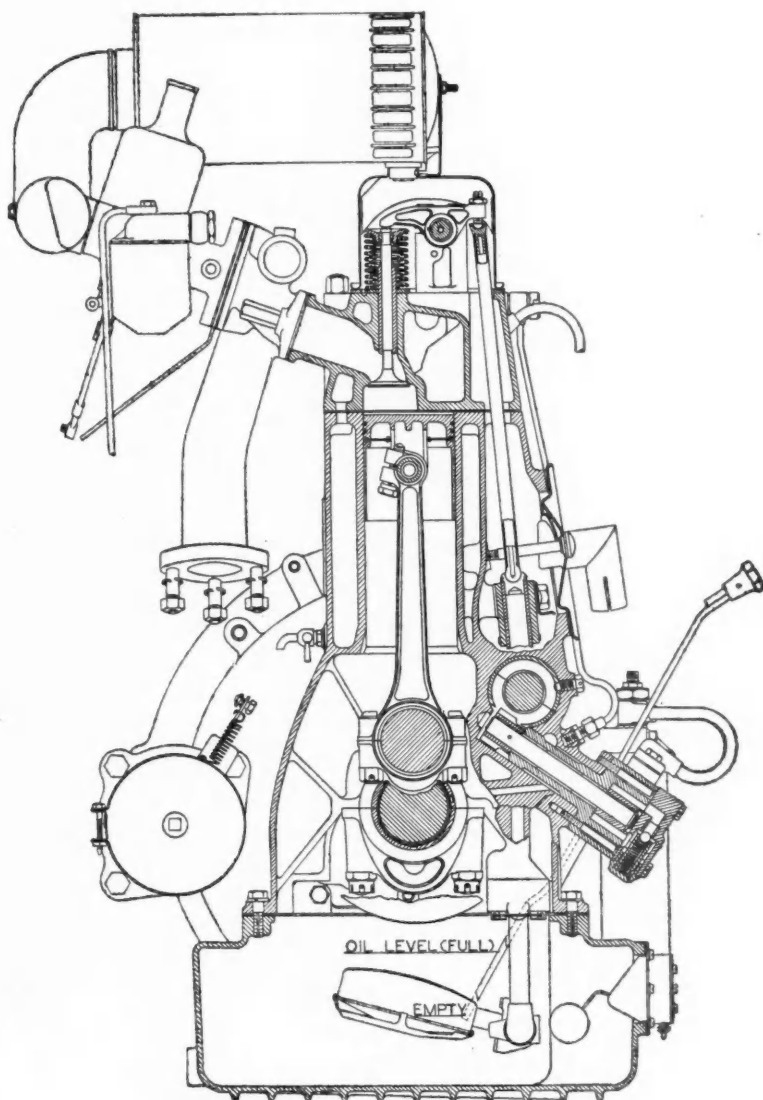


M. G. 1½-LITER ENGINE and TRANSMISSION

Transverse Section of Engine and Transmission

with electro-magnetic pump feed. Ignition is by coil and distributor, the latter driven by one of two skew gears integral with the camshaft. The other gear, driving the gear type oil pump, is at the center of the three-bearing camshaft and is straddled by the divided center bearing. Lubrication is by pressure throughout, except to the wrist pins and pistons. A floating oil intake is used and an external cartridge type filter. The pressure relief valve, integral with the oil pump, has no adjustment for spring pressure on the ball.

Transmission is by single-plate clutch with spring center and a four-speed gear-box with synchromesh on second, third and high. Ratios are 1st, 3.38; 2nd, 1.98; 3rd, 1.355, and high direct through a rear axle drive of 5.22 to 1. The latter gives a speed of 80 m.p.h. at 4600 r.p.m.



PRODUCTION LINES

Improved Service

Important development in aviation engine production has been the adoption of a unique method of precision thread grinding, which, in heat treated elements, greatly prolongs useful life, assures accurate alignment and adjustment. This grinding method has proved its utility over a period of several years. It is felt now that the process could be used to good advantage in general automotive applications, at least for many important threaded elements of heavy-duty truck and bus and industrial equipment.

Kickless Cable

Important contribution to gun welding operations is a unique type of "kickless" cable in which the reactance of high current handling cables is neutralized. It is a safety feature so far as the operators are concerned, relieves fatigue, increases the life of the cable. The new cable is water-cooled and said to deliver more current with a given secondary current with appreciably less amperage drawn from the source. Torsional twist permissible ranges as much as 720 degrees opposite helical winding to 450 degrees in direction of helical winding. Announcement of the new cable is expected within thirty days.

Power-Factor

A simple and understandable treatment of power-factor and power-factor improvement is found in a new bulletin, "Power-Factor and its Improvement," issued by General Electric. Plant engineers should have a copy of this important bulletin as it constitutes an invaluable handbook on an oftentimes obscure subject. G.-E. shows how economy is achieved with the installation of the Pyranol Capacitors, indicates the best methods of application of these units.

Relieves Fatigue

An important by-product of Clyde Paton's paper on seat cushions, presented at the recent SAE Annual Meeting, was the suggestion that a similar study should be made in connection with riding comfort in motor trucks and buses. Discussion showed that comfortable seat cushions could contribute largely to an elimination of driver fatigue, with a consequent improvement in safety on the highway.

Grades Abrasives

What is felt to be the greatest development in the abrasive field since the introduction of synthetic abrasive materials is a method for testing grinding stones, wheels, and bonded abrasives of every character. This is said to indicate accurately the exact hardness and certain other characteristics of such abrasives. Up to now it has been necessary to rely upon special skills

and, in the absence of instrumentation, it has been difficult to attain reproducible results in the hands of the user. We understand that the new technique has the indorsement of one of the large automotive manufacturers.

Well Done

One of the finest of the papers presented at the recent SAE Annual Meeting was the contribution of Ramsey on the supercharging of high speed four-cycle Diesel engines. It was well received because it provided a complete report on every phase of an important engineering development. A number of points seemed particularly significant to us: first, the vital role of aluminum cylinder heads with the supercharged engine; second, relatively low weight per brake horsepower achieved with this construction; third, the adoption of the Young cooler for improving the volumetric efficiency of the set-up; and finally, the use of Tocco hardening of the crankshaft.

Needs Power

Excellent paper by P. J. Kent, entitled, "The Automobile Headlamp Problem," presented at the SAE Annual Meeting, contains an interesting commentary on the present status of polarized light. He shows that polarization absorbs 60 per cent of the available light intensity. This means that one of the major problems, if such a system were to be adopted, is that of providing a passenger car electric power system $2\frac{1}{2}$ times present practice. We understand that there are some new developments in the offing in polarization, but the problem of light absorption still would remain as an important obstacle.

Must Have

Although a lot of fine things are said about research, top executives here and there still have to be sold on it. Obviously, one reason for this is that research, particularly fundamental research, is something that can't be placed on a cost accounting basis as a profit maker. We were told recently of the experience of a large company which was suddenly confronted with a plant shut-down due to the failure of a technical process. The research department pitched in and soon had a solution that saved the day. In this case, the cost of the shut-down per day could well be credited on the profit side of the research ledger. The incident mentioned here bears out the Ketteringism that "Research is another form of insurance policy."

Light Meter

According to a recent report, G.E.'s Nela Park organization has developed what they call a "Street light calculator." It's a device that can be carried in a test car for determinations of highway lamp illumination intensity, glare, etc., at the level of the driver.—J. G.

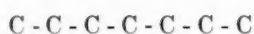
How to Use Motor Gasoline

AT THE recent Round-Table Conference on New Technologies in Transportation, T. A. Boyd and Wheeler G. Lovell of the Research Laboratories Division of General Motors Corporation discussed the properties of motor fuels, and pointed out that freedom from knock is one of the characteristics of an ideal fuel. Knock-free fuels would make it possible to obtain more power or more miles per gallon, or both. That fuels which are nearly knock-free do exist has been shown by the long series of fuel and combustion researches instituted more than 20 years ago by Charles F. Kettering. The same researches have shown in some measure what such fuels will need to consist of. Quoting from the paper mentioned:

"Early in the studies mentioned it was discovered that the thing which determines whether a fuel will knock or not is its molecular constitution, or how the bricks of carbon and hydrogen out of which the fuel molecule is constructed are put together. Here is then a very practical problem in molecular physics—to determine first just what kinds of fuel molecules the engine likes best, and to find out next how to construct them out of the raw material which nature affords.

"Without going into the subject in any detail, it may be well to present here in terms as concrete as possible a little something of what the researches spoken of have shown to be the relationship between molecular constitution and degree of freedom from knock. As before said, freedom from knock varies with the way the atoms are put together in the molecule. For sake of simplicity, the carbon atoms only will be used in the few illustrations now to be presented. The omission of the hydrogen atoms does not, however, mean that they are thought not to be important.

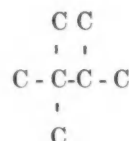
"The first rule is that concerning the length of the chain of carbon atoms. Normal heptane, with 7 carbon atoms in a continuous chain, is a very bad knocker.



This is the hydrocarbon which forms the zero

of the scale of octane numbers. Now if one carbon atom were cut off the 7 in the heptane chain, reducing the length to 6, freedom from knock would thereby be improved enough to permit engine compression to be boosted by half a ratio. Cut off 2 carbon atoms, leaving 5, and freedom from knock would be improved by the equivalent of one ratio of compression. Cut off 3 carbon atoms, leaving 4, and engine compression could be boosted by three ratios. Cut off 4 carbon atoms, leaving only 3, and engine compression could then be boosted by from 5 to 9 ratios. Thus the shorter the chain of carbon atoms the greater the freedom from knock. This is rule No. 1.

"But getting high-octane fuels by the method just outlined would not be altogether practical, for each carbon atom cut off the molecule lowers the boiling point, until soon the hydrocarbons are either gases or they must be stored under pressure. But fundamentally the improvement in octane number is a structural and not a volatility effect. And structurally there is a way to shorten the carbon chain without chopping carbon atoms out of the molecule and so making it too small to remain a liquid. As a means of raising octane number this second method is just as effective as the one described above. It consists, in effect, in shifting carbon atoms from the end of the chain off to one side of it. If this shifting is done to the maximum degree possible in the case of the heptane used in the above illustration, the resulting structure may be represented thus:



The organic chemist calls this grouping 2,2,3-trimethyl butane, but for short it has been named triptane. The hydrocarbon represented thus is so free from knock as to permit compressions 5 to 10 ratios above that possible with the long-chain heptane spoken of above. Rule No. 2, then, is that the more a hydrocarbon is compacted or centralized in space arrangement, the

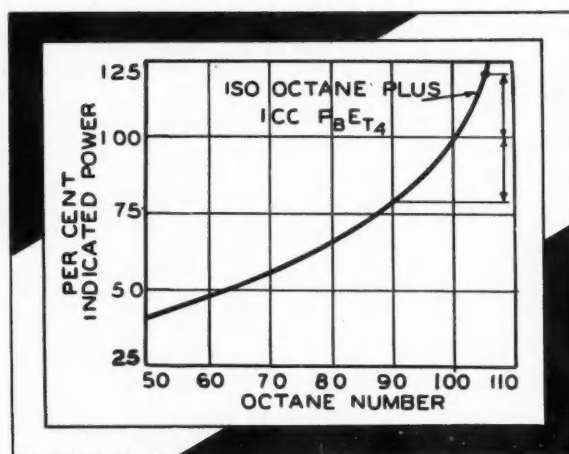


Fig. 1—How indicated power increases with octane number

to Best Advantage

freer it is from knock. This is merely a way of saying that the automobile engine likes short plump hydrocarbon molecules much better than long skinny ones.

"Another merit of fuels with closely compacted molecular structures is that generally they are particularly sensitive to improvement in freedom from knock by tetraethyl lead. In some of these fuels the effect of tetraethyl lead as a knock suppressor—what in the trade is called lead response—may be 10 times as great as it is in ordinary present-day gasolines. Thus in iso-octane 1 cc of tetraethyl lead per gallon increases the possible power output from the fuel, as obtained either through boosting compression ratio or through supercharging to the limit of the fuel, by as much as is gained in going from a 90-octane gasoline to a 100-octane fuel. Fig. 1, based upon a chart contained in a recent paper by S. D. Heron and Harold A. Beatty, is presented in illustration of the statement just made. The measurements were made in a supercharged C. F. R. engine at 1800 r.p.m. and 350 deg. Fahr. jacket.

"The gains to be had from high-octane fuels may be either in power or in fuel economy, or a combination of the two may be preferred. The highest gains in power per cubic inch can be obtained through supercharging to the limit of the fuel, as is being done in aircraft. The highest gains in economy are to be had by boosting the compression ratio as much as the fuel will allow. So far as the automobile is concerned, it would appear that from now on the car user might prefer to take the benefits mainly in terms of more miles per gallon.

"For the automobile, experimental data on the gains in miles per gallon with 100-octane gasoline, as compared with 70-octane, are shown in Fig. 2. The results plotted there were obtained by boosting the compression ratio of the engine in a conventional car, as was found possible with gasoline of approximately 100 octane number, and then modifying the axle ratio to give the original performance at 20-30 miles per hour. At 20 miles per hour the entire gain was thus in miles per gallon, and it amounted to a little more than 55 per cent. At the higher speeds the gain in miles per gallon was not quite so large. But the lower values there were due in part to the fact that the shape of

A discussion on determining what kinds of fuel molecules engines like and how to construct them out of the raw materials that nature affords

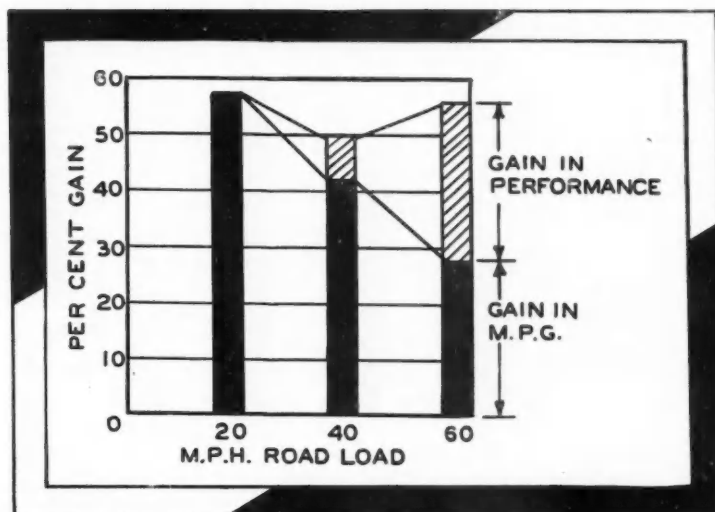


Fig. 2—Gains with 100 octane fuel as compared with 70

the power curve of the high compression engine was such as to give a residual gain in performance above that which could be converted into an improvement in miles per gallon without major engineering changes."

No prediction was made in the paper as to when high-octane gasolines will arrive, nor how free from knock they will ultimately be, but attention was called to the fact that such fuels can be made and that, if available, they could be utilized in such a way as to give considerable improvement in car miles per gallon. The job (the authors said) is to make high-octane gasolines at low cost and to find out better how to use them to best advantage. These things can be done only by means of a great deal more of exploratory or pioneering research—research on what kinds of hydrocarbons it is best to make; on how to make them most economically, and on how to use them to best advantage.

Comparison of cast iron and Durex gears:

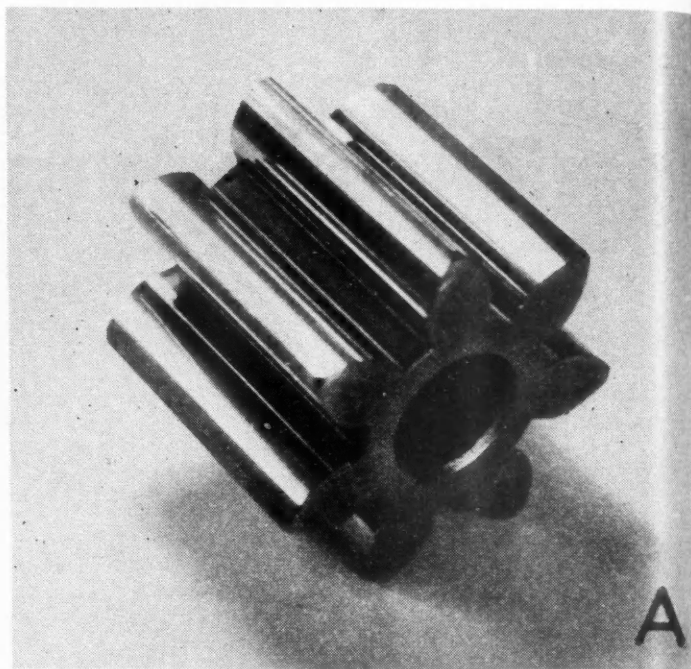
- A. burnished Durex gear
- B. machined cast iron gear
- C. cast iron blank

RECENT products of the Moraine Products Div., General Motors Corp., Dayton, include a pair of oil engine pump gears now being supplied to several important passenger car producers.

These gears are made by the porous powder metallurgy in which Moraine specializes, forming the entire gear in a steel mold, using a Swedish iron powder for the purpose. This is a unique example of the formation of a complete metal part in which the metal has never been in the molten state from the ore to the finished product. The iron powder is pressed into finely polished precision molds, then sintered at 2000 deg. Fahr.

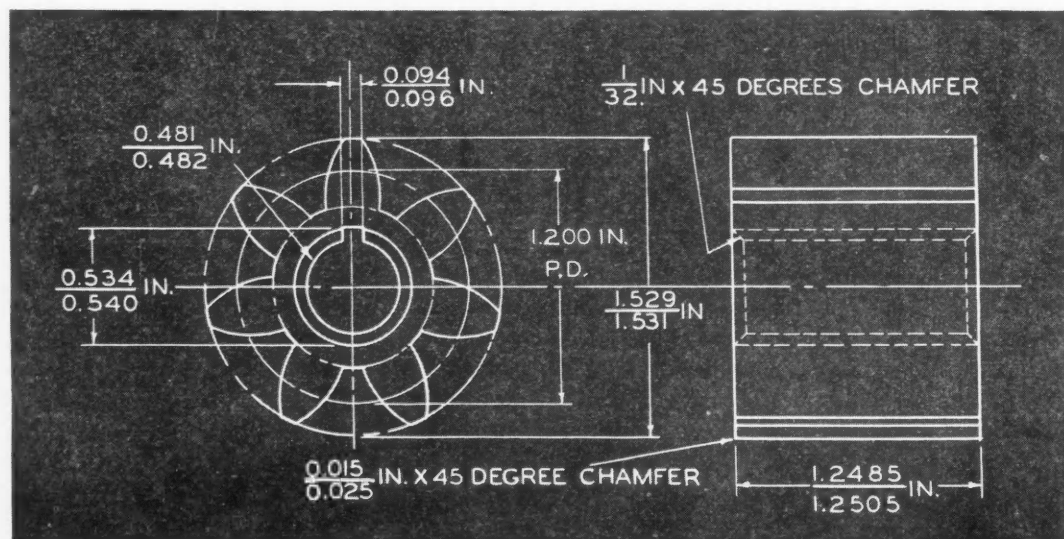
The finished gear is true to the dimensional tolerances noted on the drawing, and they are exceptionally close, without requiring finish-machining of the tooth form. Detail machining operations comprise chamfering and drilling, grinding the ends of the gear to meet the tolerance on length, grinding the outside diameter and burnishing the bore. Tooth form exhibits a handsomely polished finish as it leaves the sintering furnace which can be further enhanced by lapping the pair together. Cardinal virtue of the method is the ability to make perfectly formed involute profiles without undercut at the root and base circle. This is especially desirable in the case of small gears having the minimum number of teeth since any conventional method of gear cutting is bound to modify the detail at the root because of the clearance required for the hob or cutter.

This method then is ideal for a pump gear where volumetric efficiency is a definite function to tooth clearances.

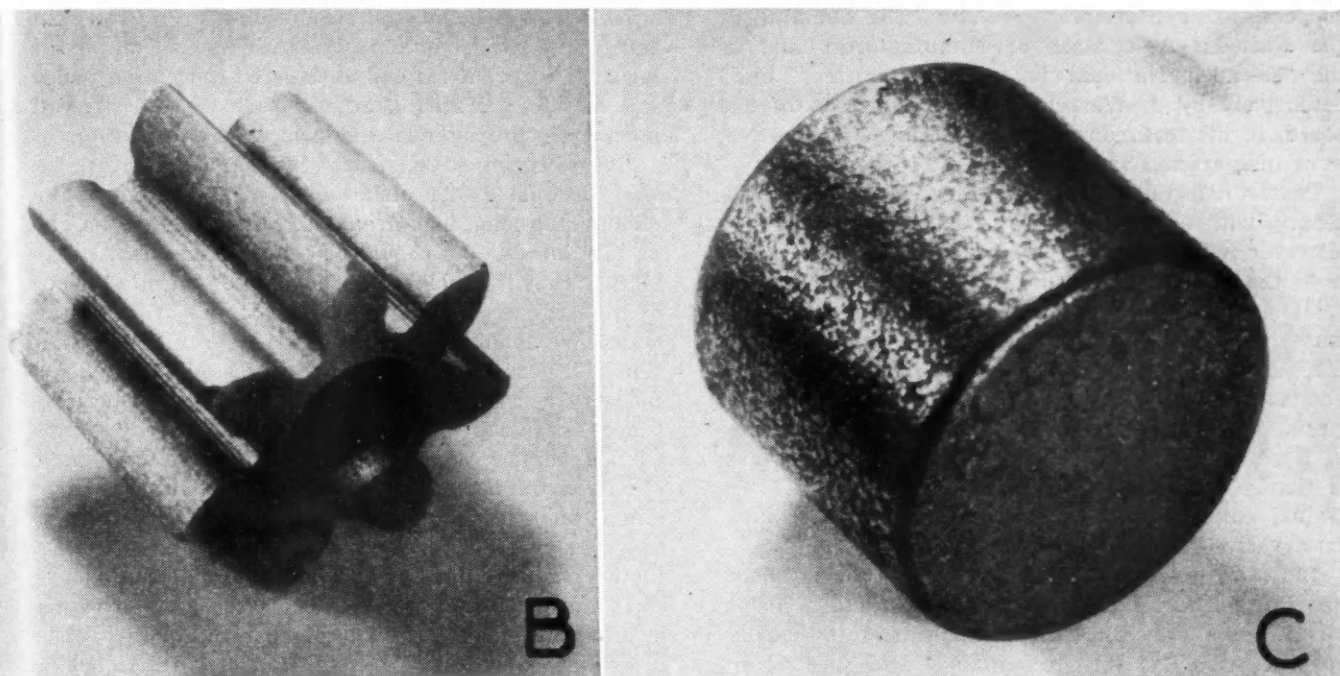


Gears of

The material used in the process is known as Durex Iron, possesses a tensile strength of 20,000 to 25,000 psi. By virtue of the porous metallurgy, the finished part has a relative density of but 75 per cent of a corresponding cast iron gear. The structure, after sintering, may be likened to that of high carbon steel but due to its porosity, it has self-lubricating qualities,



Drawing of typical gear made by the iron powder process



Iron Powder Save

***material—cut manufacturing costs—
and are held within close tolerances***

coupled with quiet running and excellent wear-resistance.

The photograph shows the comparison between the Moraine gear (left), the machined cast iron gear (center), and the cast iron blank at the right. The

cast iron blank weighs 0.8 lb., the machined gear weighs 0.28 lb., while the Durex gear weighs 0.21 lb. The savings in weight and elimination of machine scrap are obvious from this comparison and account for one of the elements of cost saving.

Do We NEED the Wagner Act? Let's Find Out

(Continued from page 138)

What is new in the National Labor Relations Act in the way of legal principle, and it is the only really new thing of this kind in it, is the setting on employers of the legal obligation to bargain collectively and the declaring of failure or refusal to do so to be an unfair labor practice against which penalties are provided. It was new, yes, but how effective has it been or can it be in "diminishing the causes of labor disputes burdening or obstructing interstate and foreign commerce?" As has often been said, you can compel men to bargain just as you can lead a horse to water but you can't make men with conflicting interests come to harmonious and mutually satisfactory agreement any more readily than you can make a fully hydrated horse drink from a trough or bucket.

This contribution of the National Labor Relations Act has so far proved to be of doubtful value. It is certainly not worth, to the country as a whole, what the application of the Act has cost us.

So much for legal principles old and new. They have not created much ado. It is the administration of the Act by the means provided in it that has caused all the hullabaloo. If any dog ever was wagged by its tail, the Wagner Act (speaking figuratively, of course), is that dog, and the tail is the Labor Board. It is a tail with unique characteristics. It can wag the dog only one way. The fact that this peculiarity is the result of design and not of accident or a freak of nature, spontaneously erected an insuperable handicap against the possibility of harmonious and

cooperative application of the law. The bulletins of the National Association of Manufacturers and of the "so-called National Lawyers Committee," cited defensively by J. Warren Madden, chairman of the board, in his testimony before the House Committee, were insignificant influences in comparison.

Doctor Leiserson says that "there is plenty of law dealing with unfair practices of labor organizations." However, when labor is threatened with prosecution, as by the recent activities of Thurman Arnold, it holds up its hands in holy horror and proclaims its sacred immunity. What Doctor Leiserson says may be so. If it is, there certainly is something else wrong somewhere. It is true, for one thing, that we have no special board to enforce the laws he refers to. We do, however, have the Department of Justice which is as capable of enforcing our laws against employers as against employees. Indeed, that seems to be a most conservative statement.

And now, what to do about it? What to do about the National Labor Act, and, more especially, about the National Labor Relations Board and its legally lopsided capacity for recognizing and protecting rights. Almost everyone directly concerned or in any way interested has some idea as to what should be done. Most suggestions involve something in the nature of tinkering. And most of them, naturally, have to do with the law as it pertains to the functions and functioning of the board. Some say fix this. Others say fix that. Make the board an agency of justice instead of a partisan advocate by enabling it to enforce employers' rights as well as those of employees. Increase the size of the board. Bribe certain present members of the board by offering them better public jobs and thus move them out. Unless we change the law first, barring voluntary resignations, that is the only way in which such a shift can be brought about without incurring the probability of a major engagement in legal warfare.

Others who offer amendments say, have the courts designate the examiners who preside at hearings. Have the Department of Justice appoint the prosecutors. Have the same rules of evidence as are used in courts of equity apply in hearings conducted by the board. Modify the board's power to designate and certify bargaining units. And so on, and so on.

Each of these, and many other suggested amendments, has merit. But, even if all were taken together, they would not get us where we ought to be. It has been suggested by one observer that to add to the Wagner Act all of the non-conflicting amendments that have seriously been offered would be like grafting a pine tree on a rose bush. It might make a better simile to say that it would be like grafting lilies-of-the-valley on a skunk cabbage.

It may be that what we should do is to repeal the Act, abolish the Board and start all over again. We shall not do it. In an election year it would not be possible and in any year it might not be immediately expedient. But whatever we do in the way of providing temporary legal bridgework, we should promptly start the process of getting the proper and needed legal aids to intelligent employer-employee relations by experiencing a great and thorough national mind-

washing. We should first tear up and throw away the imaginary picture of industry with its foot on labor's neck. It is an unreal and antiquated conception which has merely provided synthetic fuel for the fires of demagogic propaganda and poisonous proselyting.

Before trying to construct a workable substitute for the National Labor Relations Act, if we must, we should stop long, look deeply and listen with open and aseptic minds. We should be ready to accept the possibility that the morality, benevolence and intelligence of industry are at least as high as those of organized labor. We should be passively receptive to the suggestion that perhaps unionism has oppressed and impeded industry as much as industry has oppressed and impeded organized labor. We should ask the Senate's Civil Liberties Committee or some more competent and impartial body to inquire into the extent that labor unions and their organizers have interfered with both employer and employee rights; with rights of manufacturers, merchants and wage earners through boycotts and picketing, of which the essence of all forms is intimidation. We should consider thoroughly what it would mean to us to have all industry restricted to the closed shop. We should ask ourselves whether we want governmentally imposed and compulsory unionism, compulsory employer organization and compulsory employer-employee arbitration. The Wagner Act leads us in that direction.

We should measure the material cost of labor strife, of strikes and stoppages, on industry, workers, communities that are directly affected, and on the country as a whole. We should study the effects of unionism's restrictive policies on employment, production and national well-being. We should learn the limitations that should be placed on labor unions to insure their "lawfully carrying out their legitimate objects," to quote a few words that have issued from our Supreme Court. And we should determine more clearly and more definitely than we have so far, what those legitimate objects are.

Neoprene Seals Used In Propeller Control Unit

A design investigation, made by Hamilton Standard Propellers, division of United Aircraft Corp., covering sealing materials for hydraulically operated full-feathering propeller control mechanism revealed that seals made from neoprene compounds were the most efficient. The sealing problem in these propellers is difficult because of the variable conditions encountered. The seals must hold oil under pressures varying from 50 to 400 lb. per sq. in. The propeller is required to function normally at temperatures ranging from minus 50 to plus 150 deg. Fahr. The seals are called upon to operate under varying clearances, as the mechanism is constructed of alloys of aluminum and steel, materials with widely varying coefficients of thermal expansion. These propellers have now been in service of all types for over two years and the functioning of the seals is reported as most satisfactory.

Twin Disc Develops a Hydraulic Torque Converter

TWIN DISC CLUTCH COMPANY, Racine, Wis., has developed an hydraulic torque converter for railcar, oil-field, and general industrial uses. It is based on the Lysholm-Smith system and at present is made in three different forms all embodying the same hydraulic elements, for use under different conditions. One of these, which is particularly suited to installation in railcars, is the direct-drive converter Model DF 11,500; a second is the plain converter, Model F 11502, designed for direct connection to the engine and for hydraulic transmission of the power under all conditions; the third, Model IF 11505, is referred to as an independent converter unit and is designed for use where the engine speed is too low for the input shaft of the converter. It is designed to be driven from the engine through a chain or belt.

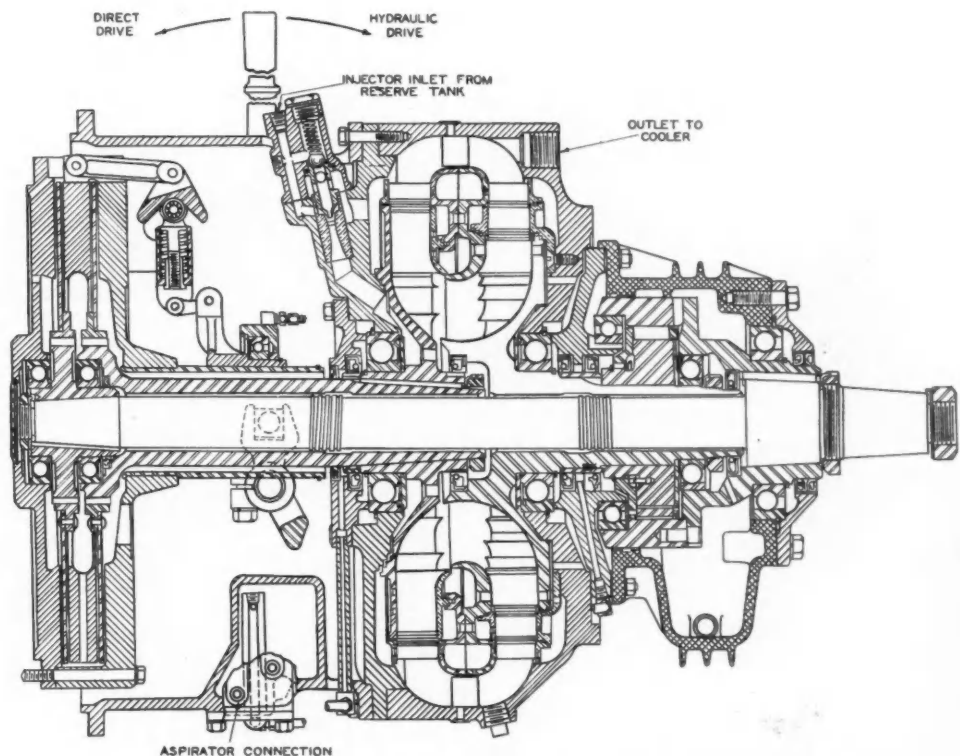
A sectional view of the direct-drive converter is shown herewith. At the left may be seen the Twin Disc patented duplex friction clutch, of which one driven disk is secured to the central, direct-drive shaft and the other to the tubular input shaft of the torque converter. This clutch is manually controlled through a spring-loaded mechanism. When the rear driven disk is engaged the impeller of the torque converter is driven at engine speed and the power is transmitted through the hydraulic unit, which is of the three-stage type, and through an over-running clutch to the output shaft. There are six sets of blades set in the hydraulic unit, the impeller having one set and the runner three sets, while two sets of stationary blades are carried by the housing. A maximum starting torque equal to about five times the engine torque can be obtained. As the speed of the driven shaft increases, the torque-multiplication ratio automatically decreases and when it becomes equal to 75 per cent the speed of the driving shaft the output torque is approximately equal to the input torque. When this speed has been approximately attained, the friction clutch is thrown into the direct-drive position. This results in a slowing down of the engine, and thereafter the drive is direct. Owing to the presence of the over-running clutch between the hydraulic unit and the output shaft, the former need not rotate when the

drive is direct, and there are no losses in it. A separate cooling unit and reserve tank must be used with the converter.

The capacity of the converter is 125 hp. at 1500, or 200 hp. at 2000 r.p.m. An efficiency curve published by the makers shows that the converter has an efficiency ranging above 80 per cent between 400 and 1000 r.p.m. of the output shaft (for 2000 r.p.m. of the input shaft). The efficiency drops to slightly below 70 per cent at 1200 r.p.m. of the output shaft, at which speed the shift to direct drive is made, and at higher speeds the efficiency is, of course, substantially 100 per cent.

The plain converter is intended for industrial installations where frequent starts have to be made under heavy load, as in hoists, cranes, switching locomotives and oil-field and logging equipment. For continuous operation the output shaft should be run at speeds ensuring more than 70 per cent efficiency, that is, at between about one-sixth and two-third the input-shaft speed. A water-jacket assembly for the unit is optional equipment.

The independent converter unit is generally similar to the plain converter, except that the input shaft is provided with a pulley or chain sprocket for the necessary increase in rotative speed from a slow-speed engine. A cooling-water jacket is standard equipment on this unit, which is equipped with a substantial structural-steel mounting base.



Longitudinal section of Twin Disc direct-drive type of hydraulic torque converter

MEN and MACHINES...

Keeping pace with the trends is the objective. As new developments prove themselves

THE ARTICLE "40 Years of Machine Tool Progress" which appeared in the Oct. 1, 1939, issue of *AUTOMOTIVE INDUSTRIES*, emphasized how the use of hydraulically operated mechanisms to actuate machine elements is steadily increasing. This trend has resulted in similar operation of lubricator pumps. Two new types of automatic lubricators with no mechanical drive connection between machine and lubricator pump have been developed by the Bijur Lubricating Corp. Heretofore, in various types of automatic lubricating equipment manufactured by this company for use on production machines, the pump has been driven mechanically from one of the machine shafts or moving units. In place of the driving mechanism, a small diameter tube (5/32 in. O.D.) is connected between the machine hydraulic system and the pump used for feeding oil to the various bearings.

The hydraulic lubricator pumps, illustrated, are of two distinct forms: Type "C" arranged for mounting on a standard two-pint or six-pint oil reservoir; and Type "G" which is particularly adapted to mounting

in a reservoir cast integral with the machine. In the construction of these units, the lubricator pump is arranged so that the inlet is submerged under the oil in the reservoir. At the unit end opposite to the lubricator cylinder and in direct line with it, is located the hydraulic operating cylinder. The two pistons (lubricator and hydraulic) are connected by a common piston rod ball-jointed to each. A compression spring surrounding the piston rod, tends to force the latter toward the hydraulic cylinder.

During the low pressure period of the hydraulic cycle, the complete piston and rod assembly moves under the action of the spring to one end of the stroke, drawing a definite amount of oil into the lubricator cylinder. Then, at the high pressure period, the assembly is forced to the other end of the stroke, discharging the oil to the bearing oil-distribution system. The hydraulic pistons are usually 5/16 in. diameter, oil pistons are 3/16 in. or 5/16 in. diameter, and the construction provides for 1/2 in. maximum stroke. A simple screw adjustment permits setting of the working stroke to any predetermined length desired to meet the lubrication needs of any particular model or type of machine equipped.

In a typical installation, a single tubing line leads from the lubricator pump to a branched distributing system of small diameter tubing connecting up the various bearings. At or near each bearing, a standard form of meter-unit is introduced in the line to control the oil feed. These meter-units function to proportion the feeds to the bearings, according to their individual needs.

Assuming a typical hydraulic system having maximum pressure of 250 lb. per sq. in. and operating on a cycle of 10 sec., the lubricator pump may be set for 3/8 in. stroke, with 3/16 in. diameter piston. Then, at each cycle, oil discharge from the pump will be 0.15 cc. (4.5 drops); and the discharge per minute will be 0.9 cc. (27 drops). If there are 17 bearings to be



Bijur hydraulic lubricator pumps. Type "C", at left, is arranged for mounting on standard two-pint or six-pint oil reservoir; and type "G", at right, is particularly adapted to mounting in a reservoir cast integral with the machine.

*of this regular feat-
they will be described*

lubricated, meter units can be selected to feed the correct proportion of oil per minute each, such as:

	Total
11 bearings fed from No. 0 meter-units, 1 drop each.....	11 drops
4 bearings fed from No. 1 meter-units, 2 drops each.....	8 drops
2 bearings fed from No. 2 meter-units, 4 drops each.....	8 drops
17 bearings	27 drops

The automatic, hydraulically-operated lubricators described have been field-tested under maximum operating conditions over a long period of time and appear to have wide possibilities of application on production machines using any of the standard hydraulic actuating systems.

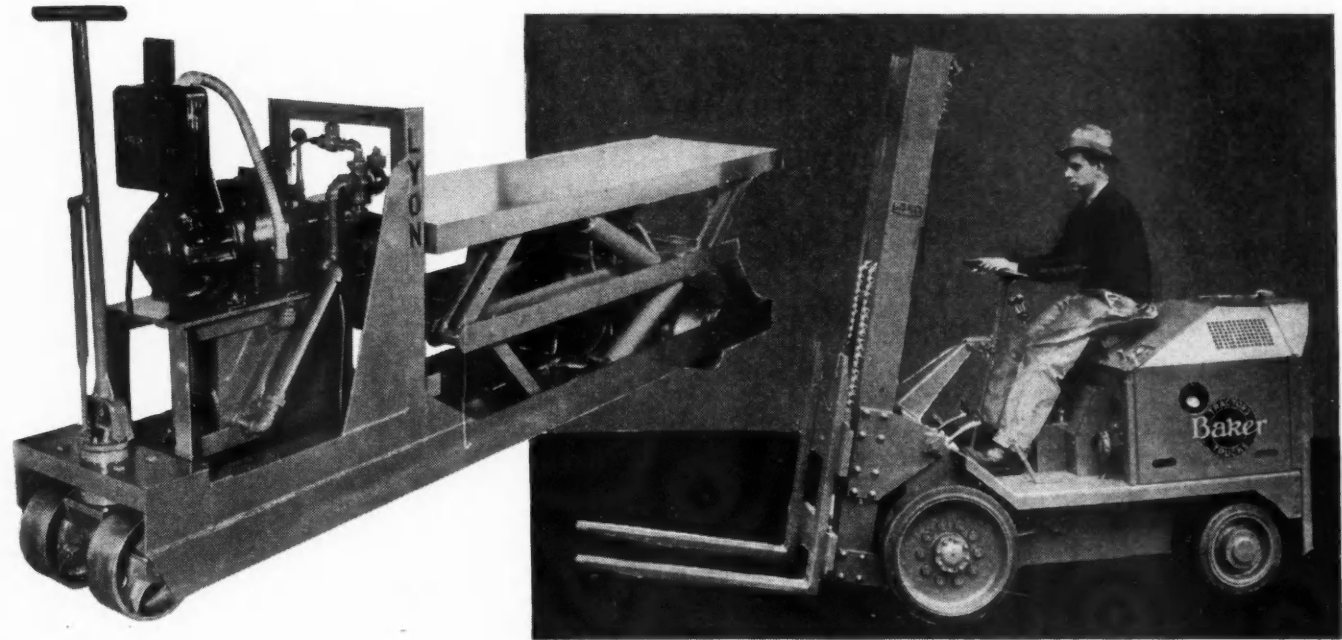
THE OLIVER INSTRUMENT CO., Adrian, Mich., has brought out a new design of tool and cutter grinder which employs the principle of the company's older type but embodies many improvements. Two views of the machine appear on this page, one shows the machine with centers in place, the other shows the



Oliver tool and cutter grinder. At top, the machine is shown with centers in place. The circle close-up shows the adjustable Timken Bearing Head with taper for mounting the various types of cutters for which it is adapted.

Below, at left, is shown a sheet handling truck with hydraulic elevating table built by the Lyon Iron Works. At the right, below, is the latest addition to the line of industrial trucks manufactured by the Baker-Raulang Co.

adjustable Timken Bearing Head with taper for mounting the various types of cutters for which it is adapted.
(Turn to page 176, please)



Road Builders Dramatize Progress

(Continued from page 144)

make good speed when they are returning empty.

As is generally known, there has been considerable complaint in recent years that loaded trucks do not have sufficient ability to maintain reasonable speeds on grades, and steps have been taken recently to have minimum requirements with respect to truck gradeability established by law. One proposed solution of this problem is represented by the Clark automatic booster unit for use on Chevrolet 1940 trucks, which was exhibited by Clark Equipment Co. A four-cylinder vertical engine is mounted on the frame of the tractor directly behind the cab, and is connected by gearing to the transmission on the regular Chevrolet powerplant, its location being such that there is plenty of clearance between it and a semi-trailer. The booster unit is said to increase the torque and power available on the rear axle by about 60 per cent in the speed range 30-40 m.p.h., thus making it possible to remain in high gear on many grades on which it would otherwise be necessary to change to a lower gear. The equipment, in addition to the engine and gearing, includes a throttle control, a vacuum control, a speed governor, and a speed-governor relay. The booster unit is said to respond automatically to the demand for more power necessary to sustain high speeds on grades. The illustration herewith shows how it is installed on the chassis.

Manufacturers of internal combustion engines were well represented at the show, and some of them had very extensive exhibits. The Buda Company, which in the past has marketed a four-cylinder "Diesel package" for replacement on Ford trucks, now has a six-cylinder engine for the same purpose, which, having the same bore and stroke, delivers 50 per cent more power and, therefore, gives the truck much greater ability. Continental showed a very extensive line ranging from its large radial aircraft engine to a small battery-charging unit known as Tiny Tim, with an output of 150 watts. Cummins Engine Co. showed a variety of its Cummins Diesel engines, including one equipped with a Schwitzer-Cummins Roots blower-type supercharger. General Motors Sales Corporation, Diesel-Engine Division, exhibited its two-stroke Diesel engines with from one to six cylinders and made use of a moving-picture machine to explain the features of the two-stroke cycle. Hercules Motors Corp. had a large exhibit of its engines and power units. The LeRoi Company also showed an extensive line of engines, including the latest addition, a four-cylinder vertical air-cooled model of 2¾ in. bore by 3 in. stroke, which develops a maximum of 16.5 hp. at 2600 r.p.m. The four cylinders are cast in a block of chrome-nickel iron, with integral fins over which air is blown by an enclosed fan incorporated with the engine. The standard equipment of the open unit includes supports, manifolds, a governor of the flyball type, an oil-pres-

sure pump, fan wheel, shrouding and air ducts, starting crank, carburetor with choke and idling controls, oil-bath air cleaner, mechanical fuel pump with filter, high-tension magneto, spark plugs, ignition cable, switch, and muffler. The weight of the open unit is 290 lb.

Small engines combined with generators and for industrial use were shown also by the Lauson Company, Stover Mfg. & Engine Co., and Novo Engine Company. Murphy Diesel Engine Company showed a number of its large, multi-cylinder Diesel engines, including one equipped with the McCulla Roots-type blower for supercharging. Waukesha Motor Company exhibited a full line of its Hesselman and multi-fuel engines, which latter, with slight changes in the equipment, can be operated on gasoline, Diesel fuel, natural gas, producer gas, propane or butane. Wisconsin Motor Corporation featured its small industrial engines recently described in *AUTOMOTIVE INDUSTRIES*.

Ignition equipment was exhibited on a number of stands. Wico Electric Co. of Springfield, Mass., showed its Electromag ignition unit for trucks, buses and tractors. This is a magneto of such design that it can replace the ordinary battery-ignition unit, being driven at camshaft speed, the same as the battery unit. It is designed to generate two, four, six or eight sparks per revolution, depending on the number of cylinders in the engine for which it is intended. To make it unnecessary to spin the engine for starting on the magneto, the Electromag can be supplied with an impulse coupling. Alternately, the engine may be started on battery current for ignition. The unit contains all of the elements of the ordinary battery-ignition unit, viz., a coil, breaker, condenser, and distributor, so that when the battery is switched into the primary circuit and the engine is turned over, a battery spark is produced. It is claimed that the permanent magnets used in this unit, which are of nipermag steel, have such high coercive strength that they are not demagnetized by the battery current.

Fairbanks-Morse Company showed their new FMJ type of magneto, which is made in one, two, and four-cylinder types. It is of smaller design than earlier types and is especially adapted for installation where space is limited. The permanent magnets are made of alnico steel. This magneto is of the inductor type, with stationary windings.

Edison-Splittorf Corporation showed its magnetos, spark plugs, and glow plugs, the latter for starting Diesel engines. Among the spark plugs displayed was the HC-83, a new model with ceramic insulation, for aircraft engines. These plugs, it was stated, are already being supplied to a number of engine manufacturers. The glow plugs are made in a large variety of designs, to suit different engines, and they are supplied with two types of fastening means, being either

screwed into the cylinder wall, the same as spark plugs, or else held against a tapered seat in a bore of the wall by suitable clamping means.

Glow plugs are used in combination with a switch and pilot heating element or indicator, which is mounted on the dashboard. This indicator is connected in series with the glow plug itself, and as the current flows through it, it is brought up to red heat, thus giving the operator an external indication of the temperature to which the wire of the glow plug inside the cylinder has been raised, showing him when it is time to close the starter switch. These glow plugs are made in both single-pole (for single-cylinder engines) and multi-pole types.

The J. I. Case Company also has engaged in the manufacture of magnetos, in its Emerson-Brantingham plant in Rockford, Ill.

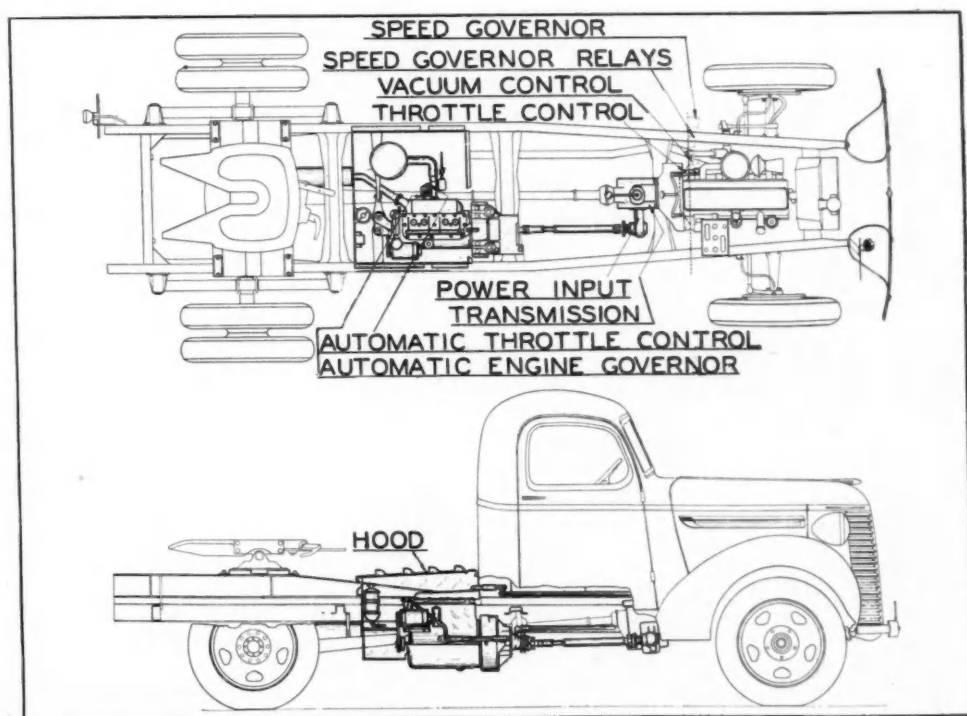
Most of the large steel companies were well represented at the show. They are interested in road building both directly and indirectly, in that they furnish steel for road construction in the form of reinforcement rods, culvert plates, highway fences, and bridge beams, flooring and cables, and they also are the source of a large part of the material for road-building machinery. Considerable use is made in such machinery of flexible steel cables, and several of the companies laid special emphasis on their products in this line.

A new type of friction clutch, known as the "Air-flex," was exhibited by the Fawick-General Company, Akron, Ohio. It is the invention of Thos. L. Fawick, who has long specialized in the design of friction clutches. Operation of this clutch (of which a section is shown on page 142) is pneumatic, the operating member consisting of a rubber-and-fabric tube similar to a pneumatic tire, except that the cross section, instead of being substantially circular, is comparatively flat in the radial direction. These clutches are made in both the expanding and the contracting form. One of the features is a rotary connection for carrying the compressed air to the operating member, through suitable tubes and fittings, this being referred to as an air seal. The main body of the air seal rotates with the clutch. The sealing surface is on a hard, carefully finished disk of non-metallic material, which operates against a ground surface on hardened steel. Mounted within a seal is a double-row ball bearing packed with grease. A rubber

hose is recommended for the air connection, as this protects the seal against excessive strains. The clutch is engaged by admitting air to the operating member by means of a control valve, and it is released by opening the interior of the operating member to the atmosphere, allowing the member to contract (or expand) by reason of its own flexibility. For exceptionally severe duty, linings of special material are provided.

Among the advantages claimed for this clutch is that it cushions shocks and damps out torsional vibrations, as a result of the flexibility and damping capacity of the rubberized fabric in the sidewalls. There are no adjustments. Slight misalignment between the shafts connected is compensated for by the flexible member of the clutch. The pressure is uniformly distributed over the entire friction surface, hence the heating effect and the wear are uniform over the entire frictional area. This clutch lends itself particularly well to remote control, because the only operating connection required is a flexible air hose. Owing to their ability to damp out shock and vibration, these clutches have come into extensive use on Diesel-powered motor boats.

Metallic friction material, known as Velvetouch bi-metallic friction material, was exhibited by the S. K. Wellman Co. of Cleveland. The friction material proper is made of powdered metals, graphite, and other substances, which are subjected to heat and pressure, and thin layers of such material are then welded to a backing of steel. Clutch facings and brake linings are produced in this way. Advantages claimed for these friction materials are that their operating characteristics are constant, that they get rid of frictional heat quickly, owing to their high thermal con-



Installation of Clark automatic booster engine on Chevrolet truck

ductivity, and thus operate at relatively low temperatures; and that they wear only slowly. Velvetouch friction material is made in two forms. One has the powdered friction metal applied to one side of the steel backing only, while the other has it applied to both sides. Large industrial tractors often are equipped with band brakes, in which the wear on the lining is concentrated near the anchor pin, where, owing to the wrapping effect, the pressure between band and drum is greatest. Some of the tractors at the show had their brake bands lined with non-metallic friction material near the free end, where the wearing effect is least, and with Velvetouch bimetallic lining near the fixed end.

Direction Signals for Motor Vehicles

(Continued from page 149)

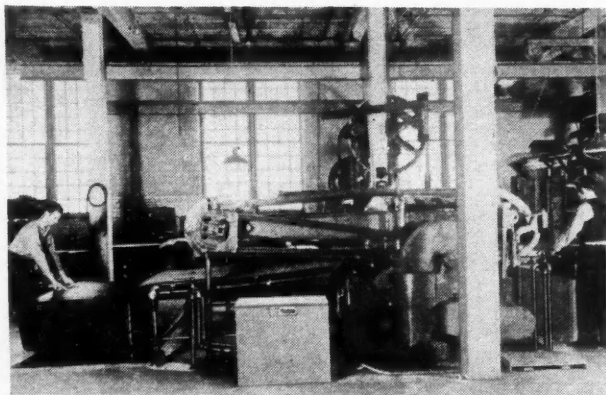
tion, where it is held by a detent spring. In this position the pawl is completely disengaged from the cam.

It will be noted that when the lever is set for a turn, the angle through which the wheel must be moved before the pawl is engaged, is greater in the direction in which the turn is to be made. This has the effect of throwing off the signal if, for example, a left-hand turn is made with the lever set in position for a right-hand turn. The friction clutch prevents any possibility of jamming and consequent interference with the steering operation. It also permits of correct timing of the switch with relation to the straight-ahead position of the steering wheel, and this without the use of tools.

Fig. 4 illustrates the method of timing the switch, while Fig. 5 shows the general design and assembly of the control switch.

New Materials-Handling Units by Rotary Lift Co.

Rotary Lift Co., Memphis, Tenn., has two new materials-handling devices. One, known as the Tabelator, consists of work tables, adjustable up or down, for machine feeding of materials in process; the other, known as the Levelator, is a hydraulic lift that takes the place of ramps for use in loading platforms and for similar applications to facilitate the handling of materials and commodities where vertical movement



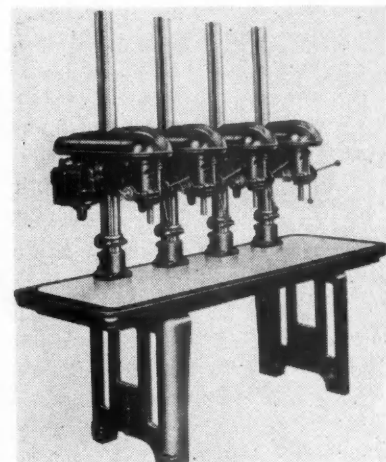
Double Tabelator installation.

is required. In the words of the manufacturer, these devices are "tailor-made" for any desired capacity or application.

A Tabelator installed in the plant of the Seaman Body Corporation is used to feed steel plates to a shearing machine. It has a capacity of 10,000 lb., a platform area of 70 by 94 in., a speed of 5½ ft. per min. and a travel of 30 in. The illustration shows another installation with a capacity of 6500 lb. The speed can be varied between the limits of 1 and 6 ft. per min. by means of a valve handy to the operator. In the illustration the power unit is shown in the center at the side of the machine, while the feeding Tabelator is shown at the right and the receiving Tabelator at the left. Working in conjunction with each other, the two Tabelators facilitate single-sheet feeding and receiving. The powerplant is a rotary electric pumping unit.

Delta Multiple-Spindle Drills

The Delta Mfg. Co., Milwaukee, Wis., manufacturer of two-spindle and multi-spindle drills, of metal-cut-



Delta four-spindle 17-in. drill press.

ting band saws and floor-stand grinders, has developed the 17-in. four-spindle drill press illustrated herewith.

The lower end of the spindle is machined to form a 16-tooth spline, fitting into a sleeve that is internally splined to fit the spindle. There is a long bearing between the sleeve and the spindle. The spindle pulley runs in two "sealed for life" ball bearings and takes all belt pull, so that none is transmitted to the spindle. The spindle also is carried in two "sealed-for life" ball bearings, which are set close together near the bottom of the quill. It does not project through the pulley, but is keyed to it. This permits the enclosure of both the belt and the pulleys in a neat built-in guard.

The entire spindle assembly may be easily removed by loosening the threaded lock ring. Either the No. 2 Morse taper spindle or a ½-in. geared Jacobs chuck may be used. The spindle return-spring housing is provided with a worm-and-gear wind, to eliminate danger of "fly-back" when adjusting the spring tension. The spring housing has a depth gage. Raising mechanisms for both the head and the table are equipped with ball bearings.

NEWS OF THE INDUSTRY

Australia Pushes Automotive Plans

Bounty for Domestic Producers Announced

Plans for the domestic production of complete motor vehicles in Australia continue apace. A bill recently introduced in the Australian House of Representatives provides for a bounty to car manufacturers of £30 each for the first 20,000 engines, £25 for the next 20,000 and £20 for the third 20,000, the bounty to be conditional upon production of at least 8000 engines a year of 15 hp. or more. The bill, it was stated, will not come into operation until the Governor-General of the Commonwealth announces that he is satisfied that there is a factory properly equipped to manufacture at least 8000 engines a year.

Australian Consolidated Industries Ltd., is reported as promoting a company with a capital of £2,000,000 for the production of motor vehicles in that country. It was believed that the new company would not be actually formed until after a preliminary survey in the United States had been made. A.C.I., until recently named Australian Glass Manufacturers, Ltd., has practically a monopoly of all glass products used in Australia and recently acquired subsidiaries concerned with structural steel construction. A. E. Smith, a director of A.C.I., has been in this country for some weeks and is said to be making preliminary negotiations for the purchase of a suitable automobile plant. His brother, W. J. Smith, managing director of A.C.I., is expected in the United States this month.

R. J. D. McCallum, formerly of General Motors-Holden's, Ltd., has been



Airing the Report

Thumbing through the company's annual report, B. C. Heacock, president of Caterpillar Tractor Co., sat in front of a microphone in a Peoria, Ill., radio studio and informally explained to 11,500 employees the "whys and wherefores" of the 24-page booklet. Utilization of the home town radio was a further step toward the company's desire to completely humanize its annual statement which, for the third consecutive year, has been written for and mailed to employees as well as stockholders. Mr. Heacock was happy to be able to report a net profit of \$6,004,890.37 for 1939 as compared with \$3,235,709.49 for 1938.

named assistant to W. J. Smith in the new enterprise. General Motors-Holden's, which recently completed a new
(Turn to page 175, please)

Lincoln Sponsors Course In Welding Engineering

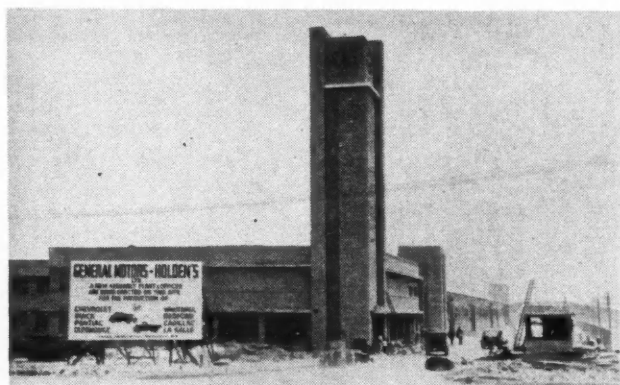
An advanced course in welding engineering sponsored by the Lincoln Elec-

tric Co. will be held in Detroit, Feb. 26 to March 1 at the Ford School. The course is directed to engineers, architects, and designers and will deal directly with the arc welding process and its application to design and fabricating problems.

The following subjects will be covered: the shielded arc, its value and use in design; weld inspection, means of checking fusion and penetration; calculating stress distribution in welded joints; use of rubber models and polarized light in studying stress distribution; a practical metallurgical study of the welding of ferrous and non-ferrous metals; organizing the welding department and estimating welding costs.

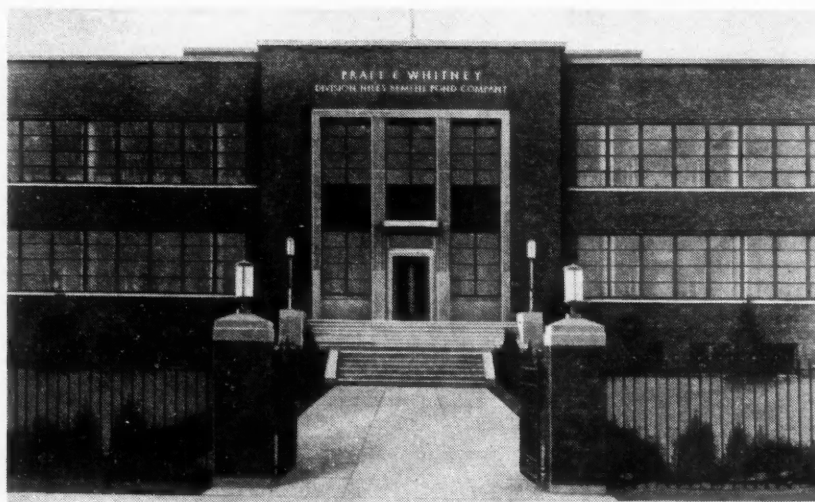
GM-Holden's

View of new plant built by General Motors-Holden's, Ltd., in Australia. Opening ceremonies were scheduled to take place early in February. The factory will have facilities for a daily output of 80 motor cars and trucks.



1939 Tractor Production Valued at \$157,744,209

Tractor production in 1939 rose to 215,283, valued at \$157,744,209, according to preliminary census returns, from 199,223, valued at \$151,998,349 in 1938.



Dedicated to Precision

The front entrance to Pratt & Whitney's new plant in West Hartford, Conn., a one-story structure, almost 1000 ft. long and 550 ft. wide, designed by Albert Kahn, Inc., to fulfill the exact needs of precision machine tool, small tool and gage manufacture. It was a huge job to move P&W's complete complement of men and machines 2½ miles across Hartford from the 23 old buildings, some of which had been occupied for 79 years.

Aircraft Manufacturers Want Machine Tools "In A Hurry"

Committee of Machine Tool Builders Plans To Arrange a System of Priority for Deliveries

Fitting in with the national defense program, machine tool manufacturers have voluntarily agreed to give priority of deliveries to American manufacturers of airplanes and airplane engines. The plan was arranged at a meeting with Secretary of the Treasury Henry Morgenthau, who will serve as a liaison between the machine tool and airplane makers for the purpose of speeding up airplane production for the War and Navy Departments. Airplane manufacturers, like machine tool producers, are heavily booked with both domestic and foreign orders, and had complained that production schedules were held up by reason of delayed deliveries of machine tools. The airplane producers previously had pledged priority in deliveries to the United States Government.

Machine tool makers, when informed of the plight of airplane manufacturers, readily agreed to give them priority. While airplane producers had described delayed deliveries of machine tools as the "bottleneck" in engine output, machine tool manufacturers said that there is no "bottleneck." They gave assurance, however, that they can rearrange their orders, and, now acquainted with requirements, estimate that at their first meeting to work out a priority system they will get 80 per cent compliance from the industry. It was stated that the arrangements for setting up the priority system will be

in charge of a committee of machine tool manufacturers and that the government will participate only to the extent of acting as a contact.

It was stated that, under the program decided upon, machine tool orders will be recapitulated and the possibility of increased allowances for depreciation and obsolescence will for tax purposes be discussed with the Bureau of Internal Revenue in the event plant facilities are expanded. No question was raised, it was reported, with respect to government aid in financing expansion.

Ourselves & Government

A Check List of Federal Action Corrected to Feb. 7

FEDERAL TRADE COMMISSION

F.O.B. PRICE CASE—Trial examiner's hearing held in Ford case in Detroit on Nov. 2. Trial examiner's report next development due. Testimony closed in GM case. Both trial examiner's report and commission's brief filed. Respondent's reply brief, on which an extension of time was granted, is due. Expected to follow final arguments, will be FTC order. In both cases, FTC alleged misleading price advertising.

VS. GENERAL MOTORS—Trial examiner's report due. Rebuttal testimony concluded Sept. 11. Involves FTC charge that GM dealers are required to handle GM parts exclusively.

FAIR TRADE PRACTICE RULES—Promulgation of rules now long overdue. Commission declines comment.

DEPARTMENT OF LABOR

STEEL WAGE CASE—The Supreme Court has agreed to review the Walsh-Healey steel wage determination, under which steel companies contracting with the government would be required to pay minimum wage rates ranging from 45 cents in the South to 62½ cents in the East. Government counsel sought the review but steel company litigants opposed the application for a writ of certiorari. Last October, the lower court called Labor Department's steel wage order of November, 1938, unwarranted and outside the bounds of its authority. Court injunction has been effective since March, 1939.

Foundrymen's Association Nominates New Officers

At a recent meeting of the American Foundrymen's Association, officers and directors were nominated for election

Passenger Car and Truck Production (U. S. and Canada)

	December 1939	November 1939	December 1938	TWELVE MONTHS		
				1939	1938	Per Cent Change
Passenger Cars—U. S. and Canada						
Domestic Market—U. S.	357,663	272,747	306,009	2,702,120	1,810,938	+49.2
Foreign Market—U. S.	16,092	12,505	19,997	164,604	190,047	-13.5
Canada	11,491	9,882	14,198	108,806	123,761	-12.1
Total	385,246	295,134	340,204	2,975,530	2,124,746	+40.0
Trucks—U. S. and Canada						
Domestic Market—U. S.	60,636	54,961	48,145	558,868	352,207	+58.8
Foreign Market—U. S.	17,633	11,569	14,195	151,466	135,893	+11.8
Canada	5,487	6,874	4,416	46,510	42,325	+10.0
Total	83,756	73,404	66,756	756,844	530,425	+43.0
Total—Domestic Market—U. S.	418,299	327,708	354,154	3,260,988	2,163,145	+50.8
Total—Foreign Market—U. S.	33,725	24,074	34,192	316,070	325,940	-3.0
Total—Canada	16,978	16,756	18,614	155,316	166,086	-6.5
Total—Cars and Trucks—U. S. and Canada	469,002	368,538	406,960	3,732,374	2,655,171	+41.0

at the time of the annual convention which will be held in Chicago, May 6 to 10. L. N. Shannon, vice-president and works manager, Stockham Pipe Fittings Co., Birmingham, Ala., and present vice-president of the association, was nominated for the presidency, to serve a one-year term. Herbert S. Simpson, president of the National Engineering Co., Chicago, and a past director of the association, was nominated for vice-president.

Directors nominated to serve three-year terms were: Henry S. Washburn, president, Plainville Casting Co.; George W. Cannon, vice-president, Campbell, Wyant & Cannon Foundry Co., Muskegon; L. P. Robinson, sales manager, Werner G. Smith Co., Cleveland; Harold J. Roast, vice-president, Canadian Bronze Co., Montreal, Canada; B. D. Claffey, manager, Gray Iron Division, General Malleable Corp., Waukesha, Wis.

FWD Announces a New Cab-Over-Engine Unit

A new cab-over engine unit was recently announced by The Four Wheel Drive Auto Co., Clintonville, Wis. Increased power and torque, new refinements in appearance, full range visibility, conveniently appointed and comfortable cabs, and easy access to engine as well as all other units in the power line, are among the many improvements claimed for the new FWD tractor unit, designated as Model T-32. Rated up to 40,000 lb. gross, the new Model T-32 has a wheelbase of 111 in. and a CA dimension of 74 in. The overall length is 179% in.

The six-cylinder, seven bearing crankshaft engine develops 98 hp. at 2500 r.p.m. and a torque of 270 ft. lb. The bore and stroke is 4 1/4 in. by 4 3/4 in., giving a displacement of 381 cu. in.

Stanley Horner Again President of NADA

The annual meeting of the National Automobile Dealers Association in Washington was concluded on Jan. 25 with the reelection of Stanley Horner, Washington Buick dealer, as president.

Regional vice-presidents and areas they represent were: T. B. Attmore, Washington, southeastern; Edgar D. McKean, Pittsburgh, northeastern;

Restored

—is gasoline rationing in Rome, and cars are back in circulation to a limited extent. This woman motorist is detaching one of the necessary gasoline ration coupons from the card which allows her approximately 10 gallons per month.



Globe

Lynn S. Snow, Chicago, north central; L. C. Cargile, Texarkana, Ark., south central; D. G. Kelly, Grand Forks, N. D., west mountain and William L. Hughson, San Francisco, Pacific Coast.

Other officers elected were: Johannes Schiott, Bridgeport, Conn., secretary, and David E. Castles, St. Louis, treasurer.

Mr. Horner appointed the following executive committeemen: Lynn B. Timmerman, Lima, Ohio; W. P. Sims, Phoenix, Ariz.; Hailey Sommers, Atlanta; C. A. Morris, Waterloo, Iowa, and J. W. Roby, honorary member, Shreveport, La.

New Bonding Substance For "Plastic Plane"

Additional constructional details of the Timm Aircraft Corp.'s "plastic airplane" (pictured on p. 34, AUTOMOTIVE INDUSTRIES issue of Jan. 1) have been released by the manufacturer. Experiments made by the company indicated that molded plywood would give the best results for a plane of this type. Casein glue, heretofore the best known bonding substance for this purpose, was found in tests made by Timm to have certain disadvantages which the company reports to have overcome by producing its own bonding substance, a resinous material of the phenolic type.

Method used in construction, which follows the monocoque principle, is first to directly impregnate the plywood with a phenolic material. The surfaces

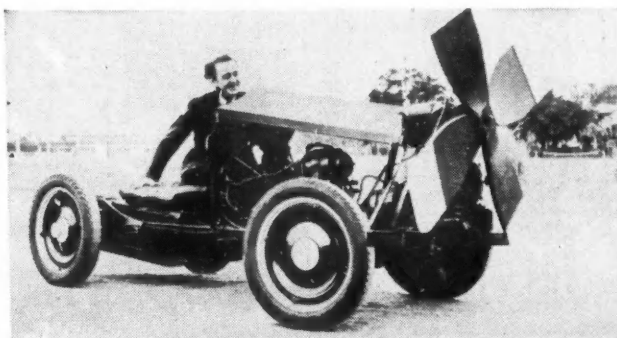
to be bonded are then coated with the new bonding material and assembled into a mold in three or more laminations, each lamination criss-crossing the other; final shape is formed by pressure. The shape is then removed from the mold and assembled onto the fuselage rings, which are also constructed of a similar laminated material. Pressure is applied to the skin and bulkhead rings and heat treatment follows.

In tests made by the company with Timm resin set cold, but not heat treated, a rib cap strip, designed to give one square inch of effective bonded area and placed in tension with the rib proper, sheared at 316 lb. After heat treatment, an equivalent cap sheared at 490 lb. Using a high grade of casein glue, a similar cap sheared at 290 lb. Additional advantages claimed for the new compound are that it is oil and water-proof, fire-resistant, does not crystallize, resists fungus and insect attacks, is strong and light, and has good sound-absorption qualities.

Car Colors Continue Trend Away from Black

Analysis of customer color options on Buick cars, covering 1940 models entered in production through Jan. 1, shows a continuing drop in demand for black. While black still predominates, with 33.9 per cent of all cars so specified, it has steadily yielded position. Only a few years ago virtually 80 per cent of Buick buyers selected black. Coming up in the color scale are the two-tone combinations offered for the first time this year on a production basis.

The analysis showed that Buick's 12 color options were wanted in the following ratio: black, 33.9; dark grey, 9.7; two-tone green, 8.8; dark green, 8.7; maroon, 8.5; light blue, 7.6; two-tone blue and grey, 5.8; light grey, 5.7; dark blue, 5.1; light green, 2.8; brown, 2.0, and cream, 1.2. Special paint jobs produced for automobile show and similar purposes accounted for 0.2 per cent of the production covered in the survey.



Acme

Economical

A Florida inventor built this machine which runs on an electric motor driven by 12 storage batteries. Wind-driven propeller runs a generator charging the batteries. The inventor figures it costs one-fourth of a cent to run the car a mile. He claims it will do 50 m.p.h.



Guests

A few guests of Sydney G. McAllister, president, International Harvester Co., at the National Road Show in Chicago. Left to right they are: Fowler McCormick, second vice-president of International Harvester; Harvey Firestone, Jr., vice-president of Firestone Tire & Rubber Co.; Sydney McAllister; and John W. Thomas, president, Firestone Tire & Rubber Co.

"Prophets" See Steel Market Falling Off to 60% Capacity

Sharp Curtailment in the Production of Flat Rolled Steel Blamed on Tardiness of Automotive Commitments

The steel market dwells largely in the realm of prophecy. Just as there were predictions of capacity operations when plus signs were first chalked up five months ago, so now that the operating rate of steel mills has yielded ground for six weeks in succession, many forecast a dip to below three-fifths of capacity operations before a pickup makes itself felt.

Tardiness on the part of automobile manufacturers in placing fresh commitments is held responsible for a sharp curtailment in flat rolled steel production. Current bookings range from 40 to 50 per cent of capacity, so that about a third of the output goes to whittle down backlogs. What eagerness there may have been to expedite arrange-

ments for covering second quarter needs of sheets and strip steel is thought to have been tempered by the slower pace of automobile assemblies. Negotiations of an informal sort are reported to continue, but steel producers and automobile manufacturers understand one another's problems so well these days, that there is no longer any need of shouting from the housetops on the subject of price. The smaller steel producers, of course, are watching the situation closely, because each wants a share of the business commensurate with his facilities.

With regard to the recent sale of iron ore by the leading steel interest to Ford, it is now pointed out by those, supposed to be in the know, that the

price was based on delivery at the head of the Great Lakes and not for delivery at Detroit, so that the cut under the 1940 price schedule of the leading iron ore companies would not be as large as at first reported.

It is reported from London that the next meeting of the International Tin Committee will be held Feb. 26, at which time export quotas for the second quarter may be fixed. Slow buying by consumers gave the market a lackadaisical undertone. Nor are consumers much more interested in offerings of copper. One of the large producers is reported contemplating enlargement of one of its principal refineries.—W.C.H.

PUBLICATIONS

Mechanical Goods division, United States Rubber Co., has recently issued a 34-page booklet entitled *U. S. Hose Hints*. The booklet is designed to enable customers to get more service out of the various types of hose used, and to help select the correct hose for specific purposes.*

A 43-page booklet, "Transportation of Tomorrow and Its Relation to Society and Economics," written by A. F. Hickman, special project engineer, is being distributed by Truck Equipment Co., Inc.*

Suggestions concerning motor truck scales and National Bureau of Standards regulations are contained in a brochure being issued by Toledo Scale Co. Included is information concerning three new truck scale lines introduced by Toledo.*

An example of an inexpensive employee safety booklet is the eight-page book prepared by Reliance Electric & Engineering Co. intended for distribution to its employees.*

Guaranteed Parts Co., Inc., has issued its complete 1940 supplementary catalog. In this supplement has been included passenger car and truck information covering the application of parts for 1940 models and there has also been included merchandising helps and cabinet assortments.*

Marmon-Herrington Co., Inc., has published a new catalog describing and giving

New Passenger Car Registrations

	December 1939	November 1939	December 1938	TWELVE MONTHS		Per Cent Change, 12 Months, 1939 over 1938	Per Cent of Total Twelve Months		TWO MONTHS MODEL YEAR		
				1939	1938		1939	1938	1940	1939	Per Cent Change
Chevrolet	64,819	59,520	51,132	598,341	484,337	+ 29.0	22.55	24.55	124,333	103,984	+ 19.9
Ford	45,285	46,005	37,914	481,496	363,688	+ 32.5	18.15	19.23	91,290	66,586	+ 37.0
Plymouth	16,875	11,772	34,605	349,807	286,241	+ 22.0	13.15	15.14	28,647	67,292	- 57.5
Buick	24,585	26,853	18,446	218,995	166,380	+ 32.0	8.24	8.81	51,448	37,831	+ 36.0
Dodge	9,776	3,570	17,041	176,585	104,881	+ 68.4	6.66	5.55	13,346	28,069	- 52.3
Pontiac	18,508	17,741	13,582	159,836	98,399	+ 62.5	6.02	5.20	36,249	25,740	+ 41.0
Oldsmobile	16,797	16,780	14,021	146,412	92,398	+ 58.7	5.52	4.89	33,577	25,403	+ 32.0
Studebaker	8,422	8,741	4,391	84,660	41,504	+104.0	3.19	2.19	17,163	9,468	+ 81.1
Mercury	7,468	6,661	4,518	65,884	6,835	+865.0	2.48	.36	14,129	6,635	+107.0
Chrysler	3,694	2,184	6,452	63,956	46,184	+ 38.3	2.41	2.44	5,878	10,797	- 45.6
Hudson	7,671	8,671	4,689	62,855	40,889	+ 53.7	2.37	2.17	16,342	9,407	+ 74.0
Packard	6,858	7,969	4,210	62,005	49,163	+ 26.3	2.34	2.60	14,827	9,067	+ 63.8
Nash	4,777	4,844	3,695	54,050	31,814	+ 70.0	2.04	1.68	9,621	8,604	+ 72.0
De Soto	2,914	2,019	4,828	51,951	35,259	+ 47.3	1.96	1.86	4,933	8,085	- 39.0
La Salle	2,466	2,736	2,369	22,197	15,732	+ 41.0	.84	.83	5,202	4,604	+ 13.2
Lincoln	2,123	1,903	1,907	19,940	16,991	+ 17.3	.75	.90	4,025	3,362	+ 19.8
Willis-Overland	1,817	2,107	1,117	14,734	13,012	+ 13.3	.56	.69	3,924	1,922	+104.0
Cadillac	1,479	1,267	1,398	13,090	10,639	+ 23.0	.49	.56	2,746	2,656	+ 3.7
Graham	48	60	406	3,660	4,139	- 11.5	.14	.22	109	714	- 84.8
Bantam	82	69		1,227			.05		151		
Crosley	49	58		1,161			.04		107		
Hupmobile	7	13	62	907	1,020	- 11.0	.03	.08	20	101	- 80.2
Fiat		2		86					9		
Miscellaneous	17	16	190	542	1,516	- 64.2	.02	.08	33	299	- 89.0
Total	246,544	231,571	226,973	2,653,377	1,891,021	+ 40.0	100.00	100.00	476,115	427,826	+ 11.9
Chrysler Corp.	33,259	19,545	62,926	641,299	472,565	+ 36.0	24.17	24.99	52,804	114,243	- 53.8
Ford Motors Corp.	54,816	54,569	44,339	567,320	387,514	+ 46.6	21.38	20.49	109,445	76,783	+ 43.0
General Motors Corp.	123,654	124,907	100,948	1,158,871	847,885	+ 36.7	43.68	44.84	253,561	200,218	+ 26.5
All Others	29,755	32,550	18,760	295,887	183,057	+ 56.0	10.77	9.68	62,305	36,582	+ 70.6

specifications on some of its line of all-wheel-drive motor vehicles.*

How the Radiator Shutter Affects Truck Operations is the title of a folder published by Pines Winterfront Co.*

A new catalog by Driver-Harris Co. gives detailed data on electrical heat-corrosion-resisting alloys.*

Federal Automotive Excise Taxes Should Be Repealed, a statement submitted to the U. S. Treasury Dept. by Sidney Waldon, chairman, A.A.A. National Motor Vehicle Taxation Committee, has been printed in booklet form and is being distributed by the American Automobile Association.*

Chicago Metal Hose Corp. has published a new bulletin on its "Rex-Bellows" stainless steel flexible tubing.*

An analysis of the principles and procedures relating to contracts between government and private business is contained in the combined November-December issue of the National Association of Manufacturers' Law Digest.*

The American Society for Testing Materials has published a booklet entitled "Evaluation of Petroleum Products—A Résumé of Present Information."*

The 1940 edition of the Continental Screw Co. catalog has been released. New features include additional technical data, tables, charts and illustrations together with a complete sheet metal screw section.*

Cerro De Pasco Copper Corp. has released a 36-page booklet on methods of using Cerromatrix, a low-temperature-melting expanding alloy.*

No. 34 in the series of booklets being published by Farrel-Birmingham Co., Inc., is entitled "Something of the What, Why and Where of Unemployment."*

*Obtainable through editorial department, Automotive Industries. Address Chestnut & 56th Sts., Philadelphia, Pa. Please give date of issue in which literature was listed.

Motor Wheel to Pay 40-Cent Dividend

Motor Wheel Corp., Lansing, Mich., has declared a dividend of 40 cents per share, payable March 15, to stockholders of record at the close of business, Feb. 29, 1940.

Ameresco Gets Young Export Distributorship

Young Radiator Co., Racine, Wis., has appointed Ameresco, Inc., New York, as export distributors for its heating and cooling products.

BOOKS.....

WHO'S WHO IN TRANSPORTATION & COMMUNICATION, edited by Charles Henry Davis. Transportation Press, Inc., publishers.

This reference work covering all branches of endeavor in two closely related fields is now in preparation for issuance in mid-1940. It will contain sketches of approximately 15,000 leading figures, giving facts of the subject's career, training, and background. Also included will be marriage data, social activities, and public honors, together with home and office addresses.

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, M. W. Bourdon.

Between the lines of an announcement by W. E. Rootes, president of the Society of Motor Manufacturers and Traders, it is indicated that British makers of cars and trucks are prepared during the war to sell their products in overseas markets at under cost, if necessary. It is stated that as a result of a series of conferences between representatives of the industry and Government Departments, including Material Controllers of the Ministry of Supply, arrangements have been made to continue car and truck production on a scale at least sufficient to fulfill export market demands.

* * *

Despite appeals in the automobile and general press and deputations representing makers, dealers and users, the Chancellor of the Exchequer has refused finally to refrain from increasing the car tax in 1940 from 15s. to 25s. per hp. He contends that it is against the national interest to encourage the use of cars for non-essential purposes during the war, owing to their fuel having to be imported.

* * *

Illuminating engineers have devised a method of providing what is considered to be a safe degree of street lighting that keeps within the requirements of air raid precautions as determined by inspection from the air. It provides an intensity of 0.00025 foot-candles on the ground, and although this may sound little better than a complete black-out it represents an astonishingly effective degree of illumination by comparison, as was shown recently during a demonstration on a mile of highway in London.

* * *

Visits to a number of automobile manufacturing plants were made recently by the press under the supervision of the Director of Mechanization, Ministry of Supply, with the object of making known some of the forms of the war effort of the motor industry and showing how manufacturers had solved some of the problems arising from reorganizing to fulfill military requirements. At one plant production was being largely concentrated upon heavy-duty "knobbles" for cross-country work and a bullet-proof tire, so-called. The latter was demonstrated by an example fitted to a fully laden Army truck being "shot-up" and proving to be capable, even then, of supporting the vehicle with very little deflection and without detriment to control.

Exports and Imports of the Automotive Industry for 1939

	DECEMBER 1939		DECEMBER 1938		TWELVE MONTHS ENDED DECEMBER			
					1939		1938	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories.....		\$ 24,826,344		\$ 29,160,926		\$ 253,722,384		\$ 270,388,947
PASSENGER CARS								
Passenger cars and chassis.....	11,744	7,506,838	21,203	12,992,526	137,866	84,858,401	161,612	100,143,211
Low price range \$850 inclusive.....	10,107	5,786,486	18,461	10,091,018	122,444	68,359,398	141,281	78,326,152
Medium price range over \$850 to \$1,200.....	1,363	1,311,684	2,383	2,250,692	13,008	12,399,486	17,377	16,750,084
\$1,200 to \$2,000.....	254	364,352	281	422,310	2,057	2,968,351	2,356	3,500,441
Over \$2,000.....	20	44,316	78	228,506	357	931,166	598	1,566,534
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total).....	10,782	6,340,761	13,630	7,088,748	114,665	69,504,614	115,595	72,116,930
Under one ton.....	1,433	596,507	2,301	890,755	17,020	7,081,135	17,152	7,144,931
One and up to 1½ ton.....	7,827	3,771,155	10,202	4,660,619	80,843	42,907,398	79,908	42,874,996
Over 1½ tons to 2½ tons.....	1,102	1,033,281	776	687,729	12,106	10,764,716	11,563	9,416,051
Over 2½ tons.....	415	932,875	313	815,795	4,060	6,160,694	5,735	11,498,237
Bus chassis.....	5	6,943	38	33,850	636	690,671	1,237	1,182,715
PARTS, ETC.								
Parts except engines and tires.....		5,322,241		4,604,939		43,462,976		46,438,562
Automobile unit assemblies.....		3,952,156		3,186,634		39,731,171		36,745,210
Automobile parts for replacement (n.e.s.).....		397,491		367,154		4,267,391		3,843,757
Other automobile accessories (n.e.s.).....	699	247,561	2,107	440,781	16,138	5,597,726	16,490	5,700,997
Airplanes, seaplanes and other aircraft.....	294	21,000,157	102	2,966,451	1,220	66,386,866	876	37,977,924
Parts of airplanes, except engines and tires.....		28,893,811		1,875,124		116,910,348		21,930,343
INTERNAL COMBUSTION ENGINES								
Stationary and Portable.....								
Diesel and semi-Diesel.....	139	463,728	38	138,442	641	2,452,485	523	2,125,313
Other stationary and portable.....								
Not over 10 hp.....	1,727	87,884	1,485	80,843	16,018	896,157	16,285	881,808
Over 10 hp.....	374	229,586	149	185,892	2,429	1,450,935	3,242	1,581,830
Engines for:								
Motor trucks and buses.....	3,047	418,448	2,271	249,653	28,361	3,428,109	24,871	2,752,964
Passenger cars.....	2,871	321,934	2,907	235,547	26,075	2,399,779	38,772	3,159,289
Aircraft.....	382	3,467,105	126	832,748	1,880	14,120,035	1,307	7,899,844
Accessories and parts (carburetors).....		280,988		294,430		2,955,851		2,828,908
IMPORTS								
Automobiles (durable).....	67	72,601	40	24,132	639	520,199	580	374,862

War in Europe No Help to Japan's Automotive Hopes

Great Bulk of Reported Increased Exports Is Being Absorbed by "Home" Organizations on the Continent

The effect of the European war on Japan's automotive industry, according to our Tokyo correspondent, so far has been potential rather than tangible. This applies, in particular, to the export end of the industry.

Two-and-a-half years of the China "incident" have wrought havoc with Japan's automotive industry. Car manufacturers have long ceased to cater to civilian demand and are turning out military trucks, armored cars and tanks. Parts makers have gone into the manufacture of aircraft accessories, and tire producers are tied up with army orders too.

Any marginal capacity that might be available for export production must be left unused because of growing stringency in the supply of materials, labor and electric power. Moreover, depreciation of equipment is proceeding at a rapid pace as the merciless grind of emergency operation continues. Tool replacements are inadequate, and the shortage of lubricants and coolants has helped accelerate the process.

Official Japanese trade returns seem to disprove these statements, for they indicate an appreciable increase in exports of automobiles, parts and accessories. It is apparent that the great bulk of Japanese automotive exports is absorbed by Japanese organizations on the continent and that these shipments should be classified as military supplies.

The government of Manchukuo has lowered the import duty on automobiles to 15 per cent *ad valorem*. Heretofore the rate was 50 per cent "for the protection of the automobile industry in Manchukuo." This consisted of a minor assembling plant which turned out a handful of cars from Japanese parts and ultimately suspended operations. The outfit concerned, known as Tongho (Dowa) Automobile Co., has been invested with a monopoly on automobile imports, effective Feb. 1. Thereafter, all organizations for the importation and distribution of motorcars were to go out of business. Most American firms have already folded up.

The year-old 100-million Manchu Automobile Mfg. Co., Ltd., has an impressive headoffice in the Special City of Hsinking, at 406, Daido Omachi, but its manufacturing plants have yet to be built. Its short-cropped President Yoshisuke Aikawa has fooled newsmen for the past two-and-a-half years with announcements that he had booked passage for the United States to mobilize American investors, but he has now entrained for Europe to see how much assistance he can get there. It now appears that American Automotive interests have definitely given

him the cold shoulder.

In the Diesel field, two companies can genuinely claim that their plans have been upset by the European war. The Nippon Diesel Engineering Co., which was established several years ago with the object of producing Diesel automobiles under Krupp-Junkers patents (two-cycle opposed-piston engines), was unable to haul in equipment from Germany before the blow-up last September, and now finds that it is too late. The German engineers who were attached to the plant have been sent back to Krupp's. A similar plan had given birth to the Diesel Kikai Co. last summer. This company was to produce fuel injection equipment and other Diesel accessories under license to Robert Bosch A. G., Germany. The war exploded the project, but the company hopes to obtain the necessary assistance from American Bosch.

The Nippon Piston Ring Co. has increased its capitalization from Y3,000,000 to Y6,000,000 to obtain funds for the expansion of its Yono plant, Saitama prefecture. Toyota Automobile Co. plans to double its capital stock to Y24,000,000. The company has organized a Y6-million subsidiary in Peiping, China, known as North China Automobile Industry Co. The firm has service plants at Changchiakow, Tai-

yuan, Shihchiachwang, Tientsin, Kalgan, Hsuechow and Hsinhsiang. A foundry is under construction at Tientsin, and the assembly plant will be located in Tsingtao.

December Rim Inspections About 14% Above '38 Mark

The Tire & Rim Association reports that during December, 1939, it inspected and approved a total of 2,070,799 rims, an increase of approximately 14 per cent as compared with December a year ago. During the whole of 1939 the Association inspected and approved a total of 17,471,914 rims, an increase of almost 65 per cent above 1938.

Elco Expands For Navy Work

A 142,000 sq. ft. addition to the Electric Boat Co.'s Elco Works at Bayonne, N. J., is scheduled for completion March 12. The company is going to build 12 Elco submarine chasers and 11 Elco motor torpedo boats under a \$5,000,000 Navy contract.

NSPA December Sales Index 19% Above '38

The monthly sales index prepared by the National Standard Parts Association shows that December automotive sales were 19 per cent ahead of 1938. Increases in every division of the industry, parts, equipment, tools, original equipment and exports, were reported. While automotive sales in December



"Somewhere in England"

Passed by the British censor with the familiar "Somewhere in England" stamp, this picture shows a convoy of new troop transport vehicles leaving a huge motor works that is now almost entirely devoted to the mass production of special infantry trucks and other equipment for the Ministry of Supply.

declined 13 per cent to 137, the index level stood 14 per cent ahead of December, 1938.

Replacement parts shipped to wholesalers in December, according to the NSPA report, declined from 150 to 127, or 15 per cent. However, December parts sales were still 15 per cent ahead of December a year ago.

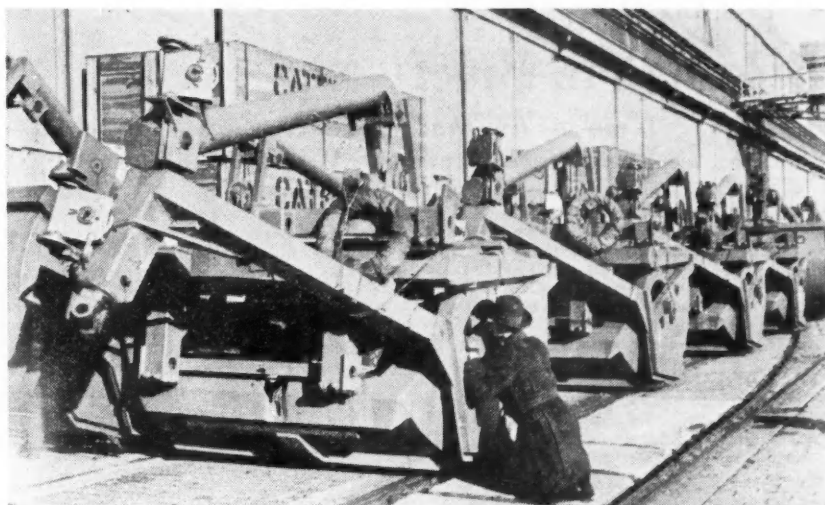
Shop equipment and tools shipped to wholesalers in December declined 17 per cent, but December was still four per cent above December, 1938. Original equipment shipped to vehicle manufacturers in December remained the same as November, but stood 21 per cent ahead of December, 1938. Export shipments, states NSPA, declined seven per cent in December, but were one per cent ahead of December, 1938.

GM Dividend Of 75 Cents

General Motors Corp. has declared a dividend of 75 cents per share on the outstanding common stock, payable March 12, 1940, to stockholders of record Feb. 15, 1940. The regular quarterly dividend of \$1.25 per share was declared on the \$5 preferred stock, payable May 1, 1940, to stockholders of record April 8, 1940.

Borg-Warner Declares Dividend of 25 Cents

Borg-Warner Corp. has declared a dividend of 25 cents per share on its common stock, payable on April 1, 1940, to stockholders of record at the close of March 15, 1940.



International

Trench Diggers

A line-up of American built trench diggers at Staten Island, N. Y., awaiting shipment overseas on French and British steamships.

1939 Was "Greatest" For Perfect Circle

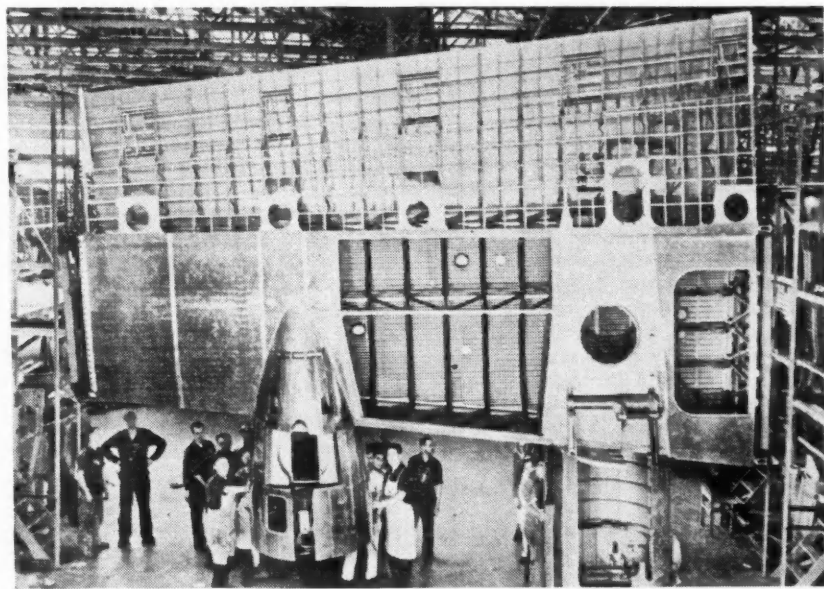
Perfect Circle replacement sales during 1939, according to Don H. Teetor, manager of replacement sales, were the greatest in the company's history. In commenting on 1940 business prospects, Mr. Teetor said, "we look forward to another banner year in 1940. The market for piston rings should be better in 1940 than it was in 1939. Undoubtedly, more new cars will be produced and there's a bigger crop of older cars that will need major repairs."

Employment at the company's plants

in Hagerstown, Tipton and New Castle, Ind., is now running at high levels. Most of the departments in all U. S. plants are operating on a two shift basis.

Ryerson Expands Chicago Plant

A modern all-steel building is nearing completion at the Chicago plant of Joseph T. Ryerson & Son, Inc., which will add 46,000 sq. ft. of floor space to the company's steel service plant. The new addition will bring the total floor space to well over 650,000 sq. ft.



Acme

Wing Panel for a Flying Fortress

One of the first photographs released by the U. S. Army Air Corps showing production at the Boeing Aircraft Co.'s No. 2 plant at Seattle, Wash. The huge wing panel for one of the 22-ton four-engined craft shown here is just out of the construction jig. It is ready to be transported by overhead cranes to a position on the wing production line where it will be completed as a unit.

40 YEARS AGO

Four years ago we took occasion to comment on the slavish imitation of horse-vehicle forms by our American designers of motor vehicles. This imitation was particularly noticeable in the height and contracted wheel base of the motor carriages then turned out. Although four years has passed, the same adherence to old forms is observed. Once the horse is discarded he should be banished even from the imagination of the motor vehicle designer if the new conditions of service are to be fully understood. The low, long construction, with strong wheels and framework, safe to run at high speeds and to turn quickly and sharply without discomfort to the occupants, and without danger of upsetting, is the only one suitable for the true type of motor vehicle if you would have it so. Time will prove this, and both time and expense will be saved if the truth of it is immediately recognized. The motor machine must skim the ground like a swallow.

From *The Horseless Age*, February, 1900.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES

Moderate recession in general business activity continued during the second half of January. The New York Times seasonally adjusted index for the week ended Jan. 20 stood at 103.7 per cent of the estimated normal, as compared with 105.0 for the preceding week and 91.4 a year ago. The Journal of Commerce unadjusted index for the week ended Jan. 27, at 101.9 per cent of the 1927-29 average, was 2.2 points below the level a fortnight earlier and 5.9 points below the mid-December figure.

Retail trade in the third and fourth weeks of January was hampered by weather conditions over broad sections of the country, with sales totals in the latter period averaging, according to Dun & Bradstreet estimates, from three to six per cent above corresponding 1939 levels. Department store sales during the four-week period ended Jan. 20 were five per cent greater than a year ago, according to the Federal Reserve compilation.

Production of electricity by the power and light industry declined by less than the usual seasonal amount in the second fortnight of the year and was 12.1 per cent above the corresponding output last year.

Railway freight movement during the week ended Jan. 27 increased more than seasonally; loadings totaled 649,488 cars, as compared with 590,459 cars a year ago.

Bank debits to individual accounts in leading cities during the week ended Jan. 24 dropped 14 per cent below the total for the preceding week

but were five per cent above the comparable 1939 figure.

Average daily production of crude oil during the week ended Jan. 27 was 3,611,600 barrels, as compared with 3,637,450 barrels in the week before, and exceeded by 41,900 barrels the required output as computed by the Bureau of Mines.

Production of bituminous coal during the week ended Jan. 20 averaged 1,638,000 tons daily, as compared with 1,662,000 tons for the preceding week and 1,362,000 tons a year ago.

Cotton-mill activity held steady against a downward seasonal tendency in the third week of January. The New York Times adjusted index rose to 144.6 from 142.0 for the week before and 119.6 a year ago.

Engineering construction contracts awarded during the five weekly periods reported this year fell 31 per cent below the corresponding 1939 total, according to Engineering News-Record; but private contracts were 31 per cent greater than last year's comparable amount.

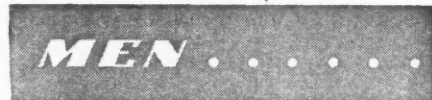
Professor Fisher's index of wholesale commodity prices for the week ended Jan. 27 stands unchanged at 85.4 per cent of the 1926 average, as compared with 86.1 a fortnight ago.

Excess reserves of the member banks of the Federal Reserve system, after six successive weekly advances, dropped \$30,000,000 during the final week of January from the estimated all-time peak of \$5,590,000,000 reported for Jan. 24.

for Relations Board; resolution calling for establishment of closed territory or more restricted territory in metropolitan areas; resolutions opposing state trade barriers and fall introduction of new automobiles.

Fred R. Lockwood

Fred R. Lockwood, chief engineer from 1914-1926 of the now defunct A. F. Detloff Co. of Detroit, automotive parts and accessories, died in Buffalo, Jan. 25, in his offices in the Universal Research Corp., of which he was president.



Edward A. Halbleib, general manager of Delco Appliance Division, General Motors Corp., was guest of honor at the forty-first annual reunion banquet of the Society of the Genesee held Jan. 22 at the Waldorf-Astoria in New York. Mr. Halbleib, one of the pioneers in the development and marketing of successful starting and lighting equipment for automobiles, was honored for conspicuous service to the community.

Benton J. Willner and Maurice E. O'Brien have been appointed assistant vice-presidents of the Inland Steel Co. Mr. Willner will assume the position of manager of sales of the Sheet & Strip Steel Division. Mr. O'Brien is manager of sales, Carbon Steel Bars & Billets.

R. A. Ludlow has resigned as manager of the lubrication department of the Richfield Oil Co. to become director of the recently inaugurated program of the petroleum industry directed toward a closer cooperation of that industry and the engineering and service departments of the automotive industry. The American Petroleum Institute has approved the plans of the lubrication committee for carrying out such a program.

L. R. Westbrook, formerly assistant director of the Cleveland, Ohio Experimental Laboratory of the Grasselli Chemicals Department, E. I. du Pont

CALENDAR

Conventions and Meetings

- SAE National Aeronautic Meeting, Washington Mar. 14-15
SAE National Transportation & Maintenance Meeting, Pittsburgh, Mar. 28-29
International Acetylene Association, Convention, Milwaukee, Wis., April 10-12
Chamber of Commerce of the United States, Annual Convention, Washington, D. C. April 29-May 2
American Society of Mechanical Engineers, Spring Meeting, Worcester, Mass. May 1-3
SAE Summer Meeting, White Sulphur Springs, W. Va. June 9-14
American Society for Testing Materials, Annual Convention, Atlantic City, N. J. June 24-28
Shows at Home and Abroad
Leipzig Trade Fair, Germany, March 3-10, 1940
National Automobile Show, Grand Central Palace, New York Oct. 12-19

N.A.D.A. Polls Dealers On Federal Legislation

As one outcome of the recent National Automobile Dealers Association convention automobile dealers throughout the nation are being asked to give their opinions on the desirability of Federal legislation designed to correct the problems of the industry. The referendum plan was adopted in lieu of

immediate action on the proposal which called for Federal legislation to restrict the channels of interstate commerce in the sale of motor vehicles to dealers for resale, to those manufacturers or distributors who deal fairly and equitably with the dealers and general public, the N.A.D.A. report said. The referendum is being accompanied by two briefs, one summarizing the favorable side of the proposal and the other summarizing its disadvantages. The answers will form the basis of N.A.D.A.'s future course of action.

Other results of the convention included authorization of N.A.D.A. counsel to institute test cases on the Federal Wage and Hour Law; proposal of support for Rhode Island dealers in legislation against the National La-

Monthly Motor Vehicle Production (U. S. and Canada)

	PASSENGER CARS		TRUCKS		TOTAL MOTOR VEHICLES	
	1939	1938	1939	1938	1939	1938
January.....	292,869	168,890	64,081	58,062	356,950	226,952
February.....	253,914	151,133	63,603	51,464	317,517	202,597
March.....	312,392	186,341	77,097	52,106	389,489	238,447
April.....	286,200	190,111	68,063	47,818	354,263	237,929
May.....	249,455	168,599	63,759	41,575	313,214	210,174
June.....	257,289	147,545	66,946	41,857	324,235	189,402
July.....	155,850	112,114	62,628	38,336	218,478	150,450
August.....	62,452	61,687	40,891	35,259	103,343	96,946
September.....	165,119	69,449	27,553	20,174	192,672	89,623
October.....	259,610	192,906	65,063	22,380	324,673	215,286
November.....	295,134	335,767	73,404	54,638	368,538	390,405
December.....	385,246	340,204	53,756	66,756	469,002	406,960
Total.....	2,975,530	2,124,746	756,844	529,161	3,732,374	2,655,171

de Nemours & Co., has been appointed research manager of the company's electroplating division. In his new position Mr. Westbrook assumes charge of all electroplating research activities of the du Pont company.

Edgar W. Trecker, former sales and advertising manager of the Kearney & Trecker Corp., has been named to the position of works manager, a vacancy caused by the death of G. E. Gustafson, who was killed in an automobile accident.

Louis C. Melzow, formerly superintendent of the McCord Radiator & Mfg. Co.'s Detroit plant, has been named assistant works manager with supervision over all branch plants.

Owing to an unfortunate illness necessitating a leave of absence for J. W. Berriman, manager of the Timken Roller Bearing Co.'s New York Branch, the company has announced the transfer from Chicago of H. C. Sauer to Mr. Berriman's post. L. J. Halderman, manager of the company's branch in Kansas City has been transferred to Chicago. F. A. Weisenberger assumes the managerial responsibilities of the Kansas City Branch, being promoted from the Pittsburgh sales force.

Jules Olivier has been appointed head of the styling division of Cadillac-LaSalle.

Major James H. Doolittle, aviation engineer and experimental pilot, has been inducted as president for 1940 of the Institute of the Aeronautical Sciences. Major Doolittle succeeds Dr. George W. Lewis, director of research of the National Advisory Committee for Aeronautics.

MEMA Index Rose to 143 in December

The regular monthly report issued by the Motor & Equipment Manufacturers Association shows that shipments of original equipment rose in December although shipments in all other cate-

AUTOMOTIVE INDUSTRIES
Summary of Automotive Production Activity

BUSES Situation unchanged from last report. Report from New York area states that a few inquiries continue, but activity is below that of year ago.

TRUCKS Makers still encouraged by outlook. Although slight falling off last month, production and sales again forging ahead. Big fleets are doing the buying.

TRACTORS Production better than anticipated at this time of year. Deliveries by dealers still "going strong" but makers feel it is anybody's guess how long this will keep up.

AUTOMOBILES Early estimates place February production of cars and trucks between 385,000 and 390,000 units which would make the month the best February in the industry's history since 1929. Trimming of schedules by some producers before the end of the month is, however, a possibility.

MARINE ENGINES Business is "surprisingly good." Some old-line builders, however, are feeling the crowding of new automotive entrants in the field.

AIRCRAFT ENGINES Although many component parts are being farmed out to other manufacturers, engine builders have been unable to reduce their backlogs of unfilled orders.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

(Copyright 1940, Chilton Co., Inc.)

gories slowed down for that month. MEMA's grand index for all branches of the industry in December rose to 143 per cent of the January, 1925, base as compared with 135 per cent for November, and 138 per cent for December, 1938.

Australia

(Continued from page 167)

plant in Pagewood, N.S.W., has been rumored linked with A.C.I. in the project although L. J. Hartnett, managing director of GM-Holden's, has denied that his firm has any connection with any move to manufacture cars in Australia.

A Canadian press cable from Sidney late last month stated that exports of Canadian and United States motor chassis to Australia may be reduced 30 per cent beginning May 1, if a proposal now believed to be under consideration by the Australian Cabinet is approved. This would mean an annual loss of \$2,250,000 to Canadian manufacturers

who already are penalized by quota restrictions. Reason given for the proposal is the necessity of conserving dollar exchange for the purchase of war supplies from the United States. British imports are not likely to be touched, it was said.

It was reported as probable that the Cabinet will not reach a decision immediately and in the meantime Charles Burchell, the Canadian High Commissioner, is understood to be making representations on behalf of Canada.

New Aeronautical Export Directory

The Export Department of the Aeronautical Chamber of Commerce of America recently conceived the idea of a loose-leaf service, known as the Aeronautical Export Directory. In this reference volume are illustrated and briefly described aircraft, commercial and military aircraft engines, as well as accessories, instruments, materials, parts, radio, airport and airways and service equipment.

Oil Company Buys Rights To Produce Buna Rubber

It is reported that the Standard Oil Co. of New Jersey has acquired from I. G. Farbenindustrie of Germany the American rights to produce buna synthetic rubber.

Col. Arthur F. Townsend

Colonel Arthur Farragut Townsend, chairman of the board of Raybestos-Manhattan, Inc., and general manager of the Manhattan Rubber Mfg. Division, Passaic, N. J., died Jan. 14, at the age of 74.

Estimated Dealer Stocks of New Passenger Cars

1938	July	August	September	October	November	December
Production—U. S. Domestic Market †.....	96,975	53,955	60,177	171,371	295,366	305,900
Retail Sales—U. S. ‡.....	153,426	123,711	90,629	134,984	241,009	241,623
Change in Inventory.....	-56,451	-69,756	-30,452	+36,387	+54,357	+64,277
Inventory, first of month.....	263,618	207,167	137,411	106,959	143,346	197,703
1939	January	February	March	April	May	June
Production—U. S. Domestic Market †.....	262,330	223,795	279,148	257,058	222,909	233,311
Retail Sales—U. S. ‡.....	180,692	165,865	276,364	265,992	276,719	254,604
Change in Inventory.....	+81,638	+57,930	+2,784	-8,934	-53,810	-21,293
Inventory, first of month.....	261,980	343,618	401,548	404,332	395,398	341,588
1939 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market †.....	142,346	56,233	155,430	239,150	272,747	357,663
Retail Sales—U. S. ‡.....	229,873	166,172	139,222	236,584	257,398	274,461
Change in Inventory.....	-87,527	-109,993	+16,208	+2,566	+15,349	+83,202
Inventory, first of month.....	320,295	232,768	122,775	138,983	141,549	156,898

†—U. S. Census Bureau. ‡—Automobile Manufacturers Association.
Stocks as of January 1, 1940 were 240,100 units.

MEN AND MACHINES

(Continued from page 163)

On this machine the work is held stationary and the grinding wheel traverses the cutting edge of the cutter. The grinding wheel is carried on the forward end of a ram which slides in a fixed bearing at the upper end of the pedestal. The motor is carried on the rear end of the ram and is belted to the grinding spindle. The grinding wheel has a stroke of 10 in. and has a bearing 15 in. in length. It is traversed by means of rack and gear, the latter

being actuated by a lever adjustable to the position of the operator.

Face mills up to 14 in. in diameter can be ground on face and periphery at one setting of the cutter in the anti-friction bearing and many odd types, such as dovetail cutters, are ground easily with the same fixture. Special fixtures have been developed for grinding round corners on end mills, for small end mills, for broach grinding, tap grinding, point thinning, etc.



IN RUNNING-IN TIME

Here is how one large machine tool manufacturer, Barnes Drill Company, recently learned in a very effective way the merits of "dag" colloidal graphite as a run-in lubricant.

Adding this solid lubricant to the oil normally used in the work rotating chuck assembly of a large horizontal honing machine, a reduction in running-in time of from 30 to 40 per cent was made. This meant a saving of 36 work hours on this operation alone - a saving which further meant lower costs and greater productivity.

Their Production Engineer reports:

"We are adding Acheson colloidal graphite to the regular lubricating oil used in the breaking-in of the cast iron bearings on our large rotating fixtures, with a resulting saving of 30 to 40 per cent in run-in time. There is also assurance that a momentary failure of the lubricating oil film will not score the bearing surface, due to the protection provided by the graphite. A considerably lower operating temperature is noted. A reduction of running-in time and temperature is also observed in small worm drive units on our smaller honing machines."

Technical Bulletin No. 112, telling how "dag" colloidal graphite works and how to use it, will be gladly sent on request. You or your oil supplier can easily add "dag" to your regular oil or to specially selected petroleum fluids.

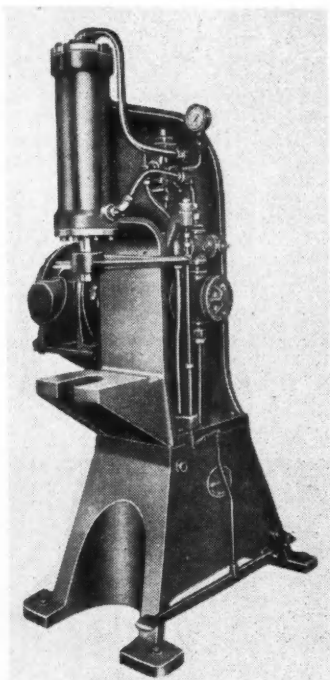
ACHESON COLLOIDS CORPORATION, PORT HURON, MICHIGAN



GREENERD ARBOR PRESS CO., Nashua, N. H., has developed a new 10 ton, completely self-contained hydraulic press. The machine can be equipped with a 10-hp. motor to give a constant speed of the ram under the full 10 tons pressure of 208 in. per min., with a return speed of 280 in. per min. Also, the press can be equipped with a 5-hp. motor to give a constant speed of 88 in. per min. Or, it can be equipped with 5-hp. motor and double pump, which will give a rapid traverse up to four tons pressure at the rate of 222 in. per min., with working speed from four to 10 tons at the rate of 88 in. per min. The ram is put into motion by pressure on pedal and pressure will remain on work until pedal is released, returning ram automatically up to power stop which may be set at any predetermined point within the 16-in. stroke of the ram. Stroke of the ram is adjustable from one to 16 in. Pressure may be set at any point between 2½ tons and full capacity of the press.

TWO NEW industrial trucks have been placed on the market in recent weeks, one manufactured by the Lyon Iron Works, Greene, N. Y., the other by the Baker-Raulang Co., Cleveland. The Lyon sheet handling truck with hydraulic elevating table has been developed to solve the problem of keeping sheets of steel at convenient heights for operators in feeding sheet metal machines. The truck, illustrated herewith, is of the toggle lever type and the table is elevated through the means of four hydraulic rams or hoists, pressure for which is furnished by a hydraulic pump driven by a 2-hp. motor. Lowering of the table is facilitated, particularly when empty, by a separate hydraulic ram. This truck is available also with a hand operated single speed or a two-speed hydraulic pump. It can be furnished in various specifications.

The new Baker gasoline-powered fork trucks known as type KM (non-telescoping) and type KMH (telescoping), are available in capacities of 4000 and 6000 lb. The engine is a four-cylinder Hercules industrial engine designed for continuous operation at high power output, and is rubber mounted to reduce vibration. Heavy-duty industrial type transmission and clutch are used, the gear-box providing two speeds forward and two reverse. Lifting and tilting motions are accomplished by a hydraulic system incorporating the latest developments in this type of equipment and consisting of a gear pump driven continuously from a power take-off and connected to the lifting and tilting jack cylinders through suitable control and relief valves. Travel speeds are normally governed to seven m.p.h., but higher speeds are available if desired. Lifting speeds are up to 30 f.p.m. and lowering speeds to 75 f.p.m. Forks may be had in any length desired. Under normal conditions, the trucks will operate in six-foot intersecting aisles.



The Greenerd Arbor Press Co.'s new 10 ton, completely self-contained hydraulic press.

ADDITIONAL new product developments are as follows: A semi-automatic threading machine made by L. J. Kaufman Mfg. Co., Manitowoc, Wis., which embodies a 30-station revolving dial having suitable work holding inserts or chucks designed to hold the particular part being processed. . . . Oxy-acetylene welding blowpipe for welding light-gage metal announced by the Linde Air Products Co., a Unit of Carbide & Carbon Corp. Although specially designed for welding in light production work and in aircraft construction, the field of usefulness for this blowpipe extends to all applications in which metals up to $\frac{3}{8}$ in. are to be joined. . . . Improved Aminco-Brenner Magne-Gage, an instrument for measuring local thickness of coatings on metals by the rapid, non-destructive magnetic method. American Instrument Co., Silver Spring, Md., manufactures this device. It will measure (1) nickel coatings on non-magnetic base metals; (2) non-magnetic, metallic or organic coatings on magnetic base metals; (3) nickel coatings on iron or steel. . . . Elastic Stop Nut Corp., Elizabeth, N. J., announces an expansion of its line through the introduction of nine new types of nuts all of which embody the basic "Elastic Stop" self-locking element, a resilient non-metallic collar which is built into the head of the nut. . . . The General Electric weld recorder which is so designed that when the electrical input to the welder varies sufficiently to cause a defective weld, a bell gives a continuous audible signal, and the weld-initiating circuit is opened automatically, preventing subsequent welding until a push button is pressed. In addition,

the recorder chart indicates visually that the weld was not within the preset limits for proper welding and shows whether the heat was above or below normal. G.E. also has redesigned its 1500-amp. constant-potential arc-welding sets for multiple-operator and machine welding. . . . The Pittsburgh Stencil & Tool Co., Pittsburgh, Pa., manufacturers of Rick Markwell Holders for stamping steel and other products, has announced a new tandem holder which is said to be particularly valuable for stamping intensely hot metals. . . . Announcement of a new 40-in. model of the Chesterman height gage has been made by the George

Scherr Co., Inc., New York. The tool is graduated in both English and metric scales to read to $\frac{1}{1000}$ in. and $\frac{1}{50}$ mm. and comes with an extra large vernier, about $2\frac{1}{2}$ in. long. . . . A new device for the protection of eyes and face of the machine operator from flying particles has been designed by Boyer-Campbell Co., Detroit. The attachment is known as the Marvel grinder shield. . . . Chapman Hone Co., Detroit, will soon offer a hone in which fluid directly forces the abrasive members against the work. Production will cover a range from $\frac{5}{16}$ in. bore, up, in straight and tapered, internal and external honing. . . . The Chicago Pneu-

Forgings

laboratory controlled

Wyman-Gordon

forgings

are under laboratory control from raw material to finished product. That's why they are always guaranteed forgings.

WYMAN-GORDON

GUARANTEED FORGINGS

WORCESTER, MASS. · HARVEY, ILL. · DETROIT, MICH.

matic Tool Co., New York, has brought out a new CP universal electric drill for metal or wood drilling up to $\frac{1}{4}$ in. capacity. The same tool also can be supplied as a screw driver for No. 8 wood or 3/16 in. machine screws; also, as a nut runner for 3/16 in. nuts or bolts. . . . Link-Belt Co., Philadelphia, has announced that it is now in position to equip all sizes of its P.I.V. Gear variable speed transmission with vernier control, for installations where extremely fine control of speed changes is required. The vernier control can be supplied with either one of two ratios— $7\frac{1}{2}$ to 1 or 30 to 1. . . . A small, portable electric Nibbler for cutting all kinds of sheet metal has been introduced by the Independent Pneumatic Tool Co., Chicago. It is only nine inches long and weighs but $3\frac{3}{4}$ lb. Known as the Thor Nibbler, it will cut up to No. 18 gage (0.049 in.) in steel and up to No. 15 gage (0.072 in.) in aluminum.—H. E. B., Jr.

December Machine Tool Exports 30% Above '38

Machine tool exports for December reached the record monthly figure of \$12,821,234, a 30 per cent increase over the December, 1938, shipments, the Machinery Division of the Department of Commerce reports. Total 1939 machine tool shipments abroad, representing the highest annual foreign sales ever recorded, were valued at \$112,571,552, a 16 per cent increase over the previous peak figure of \$97,270,616 recorded for 1938.

Outstanding increases in the December, 1939, exports of power-driven metal-working equipment were recorded for lathes, valued at \$1,904,390 against \$904,511 for December, 1938; vertical boring mills and chucking machines, \$770,439 from \$335,598; thread-cutting and automatic screw machines, \$801,006 from \$473,073; knee and column type milling machines, \$717,412 from \$269,346; gear cutters, \$466,327 from \$269,832; external cylindrical grinders, \$424,175 from \$287,885; tool, cutter and universal grinding machines, \$544,692 from \$320,432.

Publications Available on New Equipment

The 1940 edition of the Continental Screw Co. catalog has been released. New features include additional technical data, tables, charts and illustrations together with a complete sheet metal screw section.*

A descriptive folder of the Continental band filing machines has been prepared by Continental Machines, Inc.*

Herman H. Sticht & Co. has just issued a new bulletin, No. 740, on the Velox Speed Indicator (high speed hand tachometer).*

Catalog 906 of F. J. Stokes Machine Co. illustrates and describes its completely automatic molding machines.*

Bulletin T-1 of Aircraft Screw Products Co., Inc., gives engineering standards and technical information on Aero-Thread screws, studs, bolts, tapped holes and nuts.*

Chicago Belting Co. has published a book, "Hydraulic and Pneumatic Leather Packing Design and Application." This book is free to heads of engineering departments and designing engineers only in industrial plants using packings either for replacement or standard equipment.*

A folder on a new product by Danly Machine Specialties, Inc., safety guide post covers, has just been released.*

Catalog 40, describing and illustrating the complete line of Ace spot welders, has just been published by the manufacturer, Pier Equipment Mfg. Co.*

Wrought Washer Mfg. Co. has announced publication of a new stock list (No. 55-C) covering washers, expansion plugs, stampings, tools and dies.*

George Gorton Machine Co. has pub-

lished a new catalog on its cutters, grinders and accessories.*

National Broach & Machine Co. has published a folder on its Red Ring universal gear tester which includes a description of the new Red Ring lead comparator.*

Niagara Machine & Tool Works has published a 41-page catalog on its double crank presses. A new bulletin, No. 75-A, by the same company covers its Niagara hand and power operated rotary machines.*

Nice Ball Bearing Co. has just published a new catalog and data book on its complete line of ball bearings.*

*Obtainable through editorial department, Automotive Industries. Address Chestnut & 56th Sts., Philadelphia, Pa. Please give date of issue in which literature was listed.



JOHNSON

Ledaloyl
SELF LUBRICATING

BEARING BRONZE

● Do you want to eliminate noise in your bearing applications? Then try LEDALOYL.

Our exclusive process of PRE-ALLOYING the basic metals prevents the formation of harmful oxides . . . assures uniform structure throughout the bearing. Likewise, it permits the introduction of lead which provides quick, easy conformability and prevents galling or freezing to the shaft. Add to this the fact that LEDALOYL contains oil . . . up to 35% by volume . . . and you realize why LEDALOYL operates so quietly, so efficiently and for such a long period of time.

LEDALOYL is the only self-lubricating bearing with controlled lubrication. Millions of pores, evenly spaced, provide pin-point lubrication to the entire bearing area. The minute size of the pores meters the lubricant in the exact amount required for efficient operation at all speeds and loads. Likewise, the bearing absorbs the oil when the shaft is at rest. Thus you have the right amount of oil . . . in the right place . . . at the right time.

Why not try LEDALOYL on your next application. Test it in comparison to any bearing you have ever used. Compare the operating record . . . the operating temperature . . . the life and the load carrying capacity. Convince yourself that LEDALOYL is the ideal self-lubricating bearing. Your inquiry carries no obligation.

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in Stock*

LEDALOYL is now available from stocks conveniently located in principal industrial centers. Write for a copy of our latest catalogue listing sizes, prices and the location of your nearest source of supply.



JOHNSON BRONZE

Sleeve BEARING HEADQUARTERS

625 S. MILL STREET • NEW CASTLE, PA.